FACT SHEET FOR NPDES PERMIT WA0020559

City of Pateros Publicly Owned Treatment Works

Date of Public Notice: xx/xx/xxxx

Permit Effective Date: xx/xx/xxxx

Purpose of this fact sheet

This fact sheet explains and documents the decisions the Department of Ecology (Ecology) made in drafting the proposed National Pollutant Discharge Elimination System (NPDES) permit for The City of Pateros POTW.

This fact sheet complies with Section 173-220-060 of the Washington Administrative Code (WAC), which requires Ecology to prepare a draft permit and accompanying fact sheet for public evaluation before issuing an NPDES permit.

Ecology makes the draft permit and fact sheet available for public review and comment at least thirty (30) days before issuing the final permit. Copies of the fact sheet and draft permit for Pateros POTW, NPDES permit WA WA0020559, are available for public review and comment from insert month day, year until month day, year. For more details on preparing and filing comments about these documents, please see Appendix A - Public Involvement Information.

Pateros POTW reviewed the draft permit and fact sheet for factual accuracy. Ecology corrected any errors or omissions regarding the facility's location, history, discharges, or receiving water prior to publishing this draft fact sheet for public notice.

After the public comment period closes, Ecology will summarize substantive comments and provide responses to them. Ecology will include the summary and responses to comments in this fact sheet as Appendix E - Response to Comments, and publish it when issuing the final NPDES permit. Ecology generally will not revise the rest of the fact sheet. The full document will become part of the legal history contained in the facility's permit file.

Summary

The City of Pateros' Publicly Owned Treatment Works (POTW) was originally constructed and placed into operation in 1967. The construction was necessitated by the increased pool elevation (Lake Pateros) caused by the construction of the Wells Dam hydroelectric project. The facility was extensively upgraded in 1985 and has since undergone a complete and thorough upgrade which essentially abandoned the majority of the older plant. The upgraded facility went online in March of 2001.

The City's collection system was originally installed in 1954 and expanded in 1966 and now contains approximately 8.8 miles of piping. Following the recent upgrade, the most recent I & I Report received at the Department in 2017 reports the average

gallons/persons/day at 35 gallons. This is well below the EPA average of 120 gallons/persons/day. This indicates that I & I at this time have not exceeded the threshold.

The previous permit placed effluent limits on BOD5, TSS, Fecal Coliform, and pH. Pateros substantially complied with the effluent limits and permit conditions throughout the duration of the permit. The facility had only seven violations within the permit term; four late DMR submittals, two BOD numerical violations and one missed sample for Fecal Coliform.

Pateros received the Outstanding Operator's Award for 100% compliance in 2023.

The limits for the permit are unchanged from the previous permit issued in 2015, with two exceptions. The proposed permit does include a new temperature heat load limit introduced by the 2021 Columbia and Lower Snake River Temperature Total Maximum Daily Load (TMDL) written by the Environmental Protection Agency (EPA). The permit also includes new monitoring requirements for E. coli in order to develop site specific correlation between E.coli and fecal coliform.

Monitoring for DO, TKN, Nitrate, Oil and Grease, Total Phosphorus, and TDS, on an annual basis, is required to meet reapplication requirements, which will also provide a fuller effluent characterization which would support Total Maximum Daily Load (TMDL) establishment on the Columbia River. The Columbia River is under an EPA Temperature TMDL.

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I. Introduction

The Federal Clean Water Act (FCWA, 1972, and later amendments in 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One mechanism for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System (NPDES), administered by the federal Environmental Protection Agency (EPA). The EPA authorized the state of Washington to manage the NPDES permit program in our state. Our state legislature accepted the delegation and assigned the power and duty for conducting NPDES permitting and enforcement to Ecology. The Legislature defined Ecology's authority and obligations for the wastewater discharge permit program in 90.48 RCW (Revised Code of Washington).

The following regulations in the Washington Administrative Code (WAC) apply to domestic wastewater NPDES permits:

- Procedures Ecology follows for issuing NPDES permits (chapter 173-220 WAC)
- Discharge standards for domestic wastewater facilities (chapter 173 221 WAC)
- Water quality criteria for surface waters (chapter 173-201A WAC)
- Water quality criteria for ground waters (chapter 173-200 WAC)
- Whole effluent toxicity testing and limits (chapter 173-205 WAC)
- Sediment management standards (chapter 173-204 WAC)
- Submission of plans and reports for construction of wastewater facilities (chapter 173-240 WAC)

These rules require any treatment facility owner/operator to obtain an NPDES permit before discharging wastewater to state waters. They also help define the basis for limits on each discharge and for performance requirements imposed by the permit.

Under the NPDES permit program and in response to a complete and accepted permit application, Ecology must prepare a draft permit and accompanying fact sheet and make them available for public review before final issuance. Ecology must also publish an announcement (public notice) telling people where they can read the draft permit, and where to send their comments, during a period of thirty days (WAC 173-220-050). (See *Appendix A-Public Involvement Information* for more detail about the public notice and comment procedures). After the public comment period ends, Ecology may make changes to the draft NPDES permit in response to comment(s). Ecology will summarize the responses to comments and any changes to the permit in Appendix E.

II. Background information

Table 1 - Facility information

Applicant:	
Facility name and address	City of Pateros Wastewater Treatment Works 190 Lakeshore Drive Pateros, Washington 98846

Applicant:	
Contact at facility	Name: Jord Wilson Title: City Administrator Telephone #: (509) 923-2571 Email: jwilson@pateros.us
Responsible official	Name: Kelly Hook Title: Mayor Address: PO Box 8, Pateros, WA 98846 Telephone #: (509) 923-2571 Email: jwilson@pateros.us
Type of treatment	
Facility location (NAD83/WGS84 reference datum)	Latitude: 48.055686 Longitude: -119.896209
Discharge waterbody name and location (NAD83/WGS84 reference datum)	Columbia River Latitude: 48.054996 Longitude: -119.894637

Permit status

Issuance date of previous permit: April 1, 2015

Application for permit renewal submittal date: September 19, 2013

Date of Ecology acceptance of application: April 1, 2019

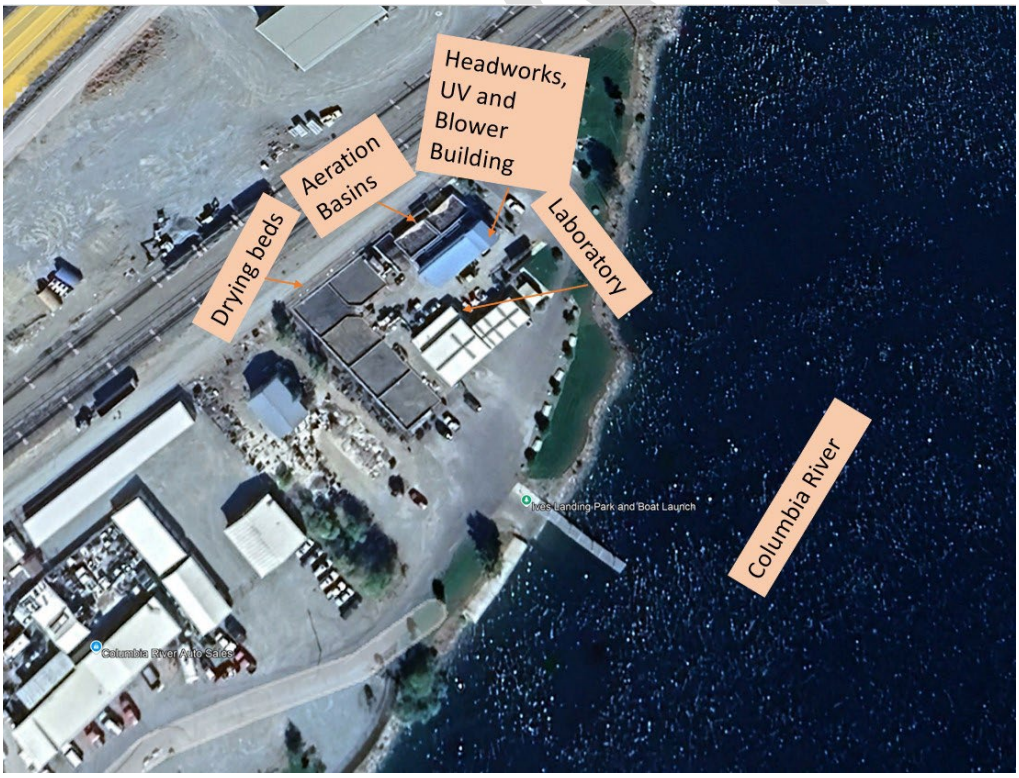
Inspection status

Date of last sampling inspection: N/A

Date of last non-sampling inspection: 09/27/2022

Figure 1 - Facility location map

Figure 2 - Facility site map



II.A. Facility description

1. History

The City of Pateros' Publicly Owned Treatment Works (POTW) was originally constructed and placed into operation in 1967 . The construction was necessitated by the increased pool elevation (Lake Pateros) caused by the construction of the Wells Dam hydroelectric project.

The facility was extensively upgraded in 1985 and has since undergone a complete and thorough upgrade which essentially abandoned the majority of the older plant. The upgraded facility went online in March of 2001.

2. Collection system status

The City's collection system was originally installed in 1954 and expanded in 1966 and now contains approximately 8.8 miles of piping. Following the recent upgrade, the most recent I & I Report received at the Department in 2017 reports the average gallons/persons/day at 35 gallons. This is well below the EPA average of 120 gallons/persons/day. This indicates that I & I at this time have not exceeded the threshold. The base year I & I value for 2017 is -0.02 MGD.

The most recent annual treatment facility review report (wasteload assessment) reporting analyzed between January 1, 2017 to December 31, 2017 states the estimated year when the current design capacity is projected to be reached is 2030. However, a review of the DMR data from January 2018 to December 2023 indicate the facility will not reach design capacity by 2030. Upon review of the DMR data for (January 2018 to December 2023), the city's forecasted approach (or projected attainment) of design capacity by 2030 is unlikely based on current usage trends listed below under Appendix D- Technical Calculations.

3. Treatment process

Formerly the POTW was an oxidation ditch activated sludge facility. An evaluation of the POTW treatment processes (February 1998 Wastewater Facilities Plan by Varela & Associates, Inc.) indicated that:

1. There was inadequate screening or comminuting occurring at the headworks;

2. There was inadequate aeration capacity at the oxidation ditch;

3. There was inadequate clarifier capacity and a poor design;

4. There was inadequate sludge drying capacity during winter months;

5. There was inadequate chlorination facilities to meet the Department's required contact

times; and

6. The influent BOD loadings consistently exceeded the design capacity of the POTW.

With regard to the chlorination facilities the report noted that:

1. The chlorination detention time at design flow was less than ½ hour, while it should be at

least one whole hour;

2. At peak design, the detention time was only 6 minutes; and

3. There were numerous worker safety hazards in and around the chlorination facilities.

As a result of these inadequacies of the POTW, the City decided to construct essentially a whole new plant at the same site of the existing facility. The upgraded plant went online in March of 2001. The upgrades included:

1. Grit removal at the headworks;

2. A mechanically-cleaned fine barscreen;

3. New activated sludge aeration basin/clarifiers;

4. New UV disinfection facilities;

5. New sludge dewatering facilities;

6. A new fence around the site; and

7. Various new buildings to house the new equipment.

With completion of the POTW upgrades, the principal treatment plant operator must be certified by the State as, at least, a Class II operator. There are few commercial users/ industrial uses. The city has xxx operators: group xx. The Pateros POTW is staffed Monday through Friday and checks are performed on the weekends.

4. Solid wastes and residual solids

The treatment facilities remove solids during the treatment of the wastewater at the headworks (grit and screenings), and at the primary and secondary clarifiers, in addition to incidental solids (rags, scum, and other debris) removed as part of the routine maintenance of the equipment. Pateros POTW drains grit, rags, scum, and screenings and disposes this solid waste at the local landfill. Solids removed from the primary and secondary clarifiers are treated are treated via Deskins Biosolids polymeric “Seaquak” system with sand filtration. The solids are used and land applied under a permit from the Okanogan County Health District. This facility has met the solid waste requirements for screening, as required by

WAC 173-308-205, by mechanical separation via auger at the headworks and polymer injection process from the digester tanks to filtration beds.

5. Discharge outfall

Secondary treated and disinfected effluent is discharged from the facility via an outfall line which extends approximately 500 feet offshore and terminates as an open-ended pipe. The outfall lies approximately 50-59 ft. below the surface of the Columbia River at River Mile 524.1.

Measurements have determined that the Columbia River is impaired for temperature at both Chief Joseph Dam and Wells Dam. There are no other nearby point source outfalls or significant nearby non-point sources of pollutants. Discharges from the cities of Chelan located about 19 river miles downstream, respectively. The Methow and Okanogan rivers enter the Columbia River in the Lake Pateros section.

The ambient background data used for this permit includes the ambient data from Ecology monthly sampling in the Columbia River at Highway 2, (RM 469.4, north of Wenatchee) for the period January 2015 to July 2024. The temperature data used were collected by the United States Geological Survey at the Chief Joseph Dam tailwater.

II.B. Description of the receiving water

Pateros POTW discharges to the Columbia River mile 524.1. Other nearby point source outfalls include the Brewster and Bridgeport POTWs. Significant nearby non-point sources of pollutants include urban and agricultural runoff. Nearby drinking water intakes have not been identified at this time. Discharges from the city of Brewster and Bridgeport POTWs. The Methow and Okanogan River enter the Columbia River in the Lake Pateros section.

The ambient background data used for this permit includes the following from USGS station 124380000 Columbia River at Bridgeport, WA, and Ecology Environmental Information Management System (EIM) station 53A070 at The Coulee Dam Bridge .5 Miles below Grand Coulee Dam:

Table 2 - Ambient background data

Parameter	Value
Temperature (highest annual 1-DMax)	21.9 °C
Temperature (highest annual 7-DADMax)	19.43 °C
pH (Maximum / Minimum)	9.2 standard units and 6.7 standard units
Dissolved Oxygen	13.2 mg/L
Total Ammonia-N	0.05 mg/L
Fecal Coliform	1.48/100 mL
Turbidity	3.25 NTU
Hardness	78 mg/L as CaCO3

II.C. Wastewater influent characterization

Pateros POTW reported the concentration of pollutants in the wastewater influent in the permit application and in discharge monitoring reports. The following tabulated data also includes Ecology inspection monitoring results. The tabulated data represents the quality of the wastewater influent from August 3, 2015 to August 30, 2024.

Table 3 - Wastewater influent characterization

Parameter	Units	# of Samples	Average value	Maximum value
Biochemical Oxygen Demand (BOD_5)	mg/L	487	235.57	510
Biochemical Oxygen Demand (BOD_5)	lbs/day	487	98.35	264
Total Suspended Solids (TSS)	mg/L	487	208.70	1187
Total Suspended Solids (TSS)	lbs/day	487	87.01	546.50
pH (Hydrogen Ion)	S.U.	2,326	7.41	8.8
Total Dissolved Oxygen (DO)	mg/L	2,327	2.08	28

II.D. Wastewater effluent characterization

Pateros POTW reported the concentration of pollutants in the discharge in the permit application and in discharge monitoring reports. The following tabulated data also includes Ecology inspection monitoring results. The tabulated data represents the quality of the wastewater effluent discharged from August 3, 2015 to August 30, 2024.

Table 4 - Wastewater effluent characterization

Parameter	Units	# of Samples	Average value	Maximum value
Biochemical Oxygen Demand (BOD5)	mg/L	487	3.02	15
Biochemical Oxygen Demand (BOD5)	lbs/day	487	1.39	7
Total Suspended Solids (TSS)	mg/L	493	15.92	675
Total Suspended Solids (TSS)	lbs/day	487	3.64	13
Flow	MGD	3,409	0.049	0.527
Ammonia	mg/L	111	1.15	29.3
Total Dissolved Oxygen (DO)	mg/L	2,336	4.87	8.8
Kjeldahl Nitrogen (TKN)	mg/L	6	0.97	1.6
Nitrate + Nitrite	mg/L	6	19.32	32.7
Oil and Grease	mg/L	6	1.87	5.6
Phosphorus	mg/L	6	3.46	4.82
Temperature	°C	2,334	16.84	25

Parameter	Units	# of Samples	Maximum Monthly Geometric Mean	Maximum Weekly Geometric Mean
Fecal Coliform	CFU/100 mL	487	15.61	193

Parameter	Units	# of Samples	Minimum value	Maximum value
pH	S.U.	2,239	7.19	8.1

II.E. Summary of compliance with previous permit issued April 1, 2015.

The previous permit placed effluent limits on effluent limits on BOD5, TSS, Fecal Coliform colony forming units, and pH.

Pateros POTW has complied with the effluent limits and permit conditions throughout the duration of the permit issued on April 1, 2015, with the exceptions listed below. Ecology assessed compliance based on its review of the facility's discharge monitoring reports (DMRs) and on inspections.

The following table summarizes the violations and permit triggers that occurred during the permit term. Permit triggers are not violations but rather when triggered require the permit holder to take an action defined in the permit.

Table 5 - Violations and permit triggers, August 2015 to August 2024.

Violation date	Parameter type	Unit type	Max limit	Measurement value quantity	Statistical base type	Violation
3/1/2017	-	-	-	-	-	Late Submittal of DMRs
1/1/2018	-	-	-	-	-	Late Submittal of DMRs
1/1/2022	-	-	-	-	-	Late Submittal of DMRs
11/1/2022	-	-	-	-	-	Late Submittal of DMRs
5/1/2024	Biochemical Oxygen Demand (BOD5)	Lbs/Day	24.6	28.56	Average Monthly	Numeric effluent violation
5/1/2024	Biochemical Oxygen Demand (BOD5)	Lbs/Day	36.9	134.1	Weekly Average	Numeric effluent violation
8/1/2024	Fecal Coliform	#/100ml	-	-	-	Frequency of

Violation date	Parameter type	Unit type	Max limit	Measurement value quantity	Statistical base type	Violation
						Sampling Violation

The following table summarizes compliance with report submittal requirements over the permit term.

Table 6 - Permit submittals

Submittal name	Submittal status	Due date	Received date
Wasteload Assessment	Submitted	9/15/2018	8/30/2018
Infiltration and Inflow Evaluation	Submitted	9/15/2018	8/30/2018
WWTP Record Drawing (As Builts)	Submitted	-	8/29/2018

II.F. State environmental policy act (SEPA) compliance

State law exempts the issuance, reissuance or modification of any wastewater discharge permit from the SEPA process as long as the permit contains conditions that are no less stringent than federal and state rules and regulations (RCW 43.21C.0383). The exemption applies only to existing discharges, not to new discharges.

III. Proposed permit limits

Federal and state regulations require that effluent limits in an NPDES permit must be either technology- or water quality-based.

- Technology-based limits are based upon the treatment methods available to treat specific pollutants. Technology-based limits are set by the EPA and published as a regulation, or Ecology develops the limit on a case-by-case basis (40 CFR 125.3, and chapter 173-220 WAC).
- Water quality-based limits are calculated so that the effluent will comply with the Surface Water Quality Standards (chapter 173-201A WAC), Ground Water Standards (chapter 173-200 WAC), Sediment Quality Standards (chapter 173-204 WAC), or the Federal Water Quality Criteria Applicable to Washington (40 CFR 131.45).
- Ecology must apply the most stringent of these limits to each parameter of concern. These limits are described below.

The limits in this permit reflect information received in the application and from supporting reports (engineering, hydrogeology, etc.). Ecology evaluated the permit application and determined the limits needed to comply with the rules adopted by the state of Washington. Ecology does not develop effluent limits for all reported pollutants. Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation.

Ecology does not usually develop limits for pollutants not reported in the permit application but may be present in the discharge. The permit does not authorize discharge of the non-reported pollutants. During the permit term, the facility's effluent discharge conditions may change from those conditions reported in the permit application. The facility must notify Ecology if significant changes occur in any constituent [40 CFR 122.42(a)]. Until Ecology modifies the permit to reflect additional discharge of pollutants, a permitted facility could be violating its permit.

III.A. Design criteria

Under WAC 173-220-150 (1)(g), flows and waste loadings must not exceed approved design criteria. Ecology approved design criteria for this facility's treatment plant in the engineering report/facility plan/plans and specifications dated February 2002 and prepared by Varela & Associates, Inc. The table below includes design criteria from the referenced report.

Table 7 - Design criteria for Pateros POTW

Parameter	Design quantity
Maximum Month Design Flow (MMDF)	0.0983 MGD
BOD_5 Loading for Maximum Month	233 lb/day
TSS Loading for Maximum Month	288 lb/day

III.B. Technology-based effluent limits

Federal and state regulations define some technology-based effluent limits for domestic wastewater treatment plants. These effluent limits are given in 40 CFR Part 133 (federal) and in chapter 173-221 WAC (state). Chapter 173-220-130 WAC requires that "effluent limitations shall not be less stringent than those based upon the treatment facility design efficiency contained in approved engineering plans and reports." The proposed permit includes technology-based limits based on the approved treatment facility design.

The table below identifies technology-based limits for pH, fecal coliform, BOD_5, and TSS, as listed in chapter 173-221 WAC, and technology-based limits based on the approved treatment facility design. Section III.F of this fact sheet describes the potential for water quality-based limits.

Table 8 - Technology-based limits

Parameter	Average Monthly	Average Weekly
BOD_5	30 mg/L	45 mg/L
BOD_5	The BOD_5 effluent concentration must not exceed fifteen percent (15%) of the average influent concentration	
TSS	30 mg/L	45 mg/L
TSS	The TSS effluent concentration must not	

Parameter	Average Monthly	Average Weekly
	exceed fifteen percent (15%) of the average influent concentration	

Parameter	Monthly Geometric Mean	Weekly Geometric Mean
Fecal coliform bacteria	200 organisms/100 mL	400 organisms/100 mL

Parameter	Daily Minimum	Daily Maximum
pH	6.0 standard units	9.0 standard units

Technology-based mass limits for BOD_5 and TSS are based on WAC 173-220-130(3)(b) and WAC 173 221-030(11)(b). Ecology calculated the monthly and weekly average mass limits for BOD_5 and TSS as follows:

Mass limit = CL x DF x CF, where:

CL = Technology-based concentration limit (mg/L)

DF = Maximum monthly average design flow (MGD)

CF = Conversion factor = 8.34

Table 9 - Technology-based mass limits

Parameter	Concentration limit (mg/L)	Influent design load (lbs/day)	Mass limit (lbs/day)
BOD_5 Monthly Average	30	233	24.6
BOD_5 Weekly Average	45	233	36.9
TSS Monthly Average	30	288	24.6
TSS Weekly Average	40	288	36.9

III.C. Surface water quality-based effluent limits

The Washington State surface water quality standards (chapter 173-201A WAC) are designed to protect existing water quality and preserve the beneficial uses of Washington's surface waters. Waste discharge permits must include conditions that ensure the discharge will meet the surface water quality standards (WAC 173-201A-510). Water quality-based effluent limits may be based on an individual waste load allocation or on a waste load allocation developed during a basin wide total maximum daily load study (TMDL).

1. Numeric criteria for the protection of aquatic life and recreation

Numeric water quality criteria are listed in the water quality standards for surface waters (chapter 173-201A WAC). They specify the maximum levels of pollutants allowed in receiving water to protect aquatic life and recreation in and on the water. Ecology uses numeric criteria along with chemical and physical data for the wastewater and receiving water to derive the effluent limits in the discharge permit. When surface water quality based limits are more stringent or potentially

more stringent than technology-based limits, the discharge must meet the water quality-based limits.

2. Numeric criteria for the protection of human health

Numeric criteria for the protection of human health are promulgated in Chapter 173-201A WAC and 40 CFR 131.45. These criteria are designed to protect human health from exposure to pollutants linked to cancer and other diseases, based on consuming fish and shellfish and drinking contaminated surface waters. The water quality standards also include radionuclide criteria to protect humans from the effects of radioactive substances.

3. Narrative criteria

Narrative water quality criteria (e.g., WAC 173-201A-240(1)) limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge to levels below those which have the potential to:

- Adversely affect designated water uses.
- Cause acute or chronic toxicity to biota.
- Impair aesthetic values.
- Adversely affect human health.

Narrative criteria protect the specific designated uses of all fresh waters (WAC 173-201A-200) and of all marine waters (WAC 173-201A-210) in the state of Washington.

4. Antidegradation

The purpose of Washington's Antidegradation Policy (WAC 173-201A-300-330) is to:

- Restore and maintain the highest possible quality of the surface waters of Washington.
- Describe situations under which water quality may be lowered from its current condition.
- Apply to human activities that are likely to have an impact on the water quality of surface water.
- Ensure that all human activities likely to contribute to a lowering of water quality, at a minimum, apply all known, available, and reasonable methods of prevention, control, and treatment (AKART).
- Apply three tiers of protection (described below) for surface waters of the state.

Tier I: ensures existing and designated uses are maintained and protected and applies to all waters and all sources of pollutions.

Tier II: ensures that waters of a higher quality than the criteria assigned are not degraded unless such lowering of water quality is necessary and

in the overriding public interest. Tier II applies only to a specific list of polluting activities.

Tier III: prevents the degradation of waters formally listed as "outstanding resource waters," and applies to all sources of pollution.

A facility must prepare a Tier II analysis when all three of the following conditions are met:

- The facility is planning a new or expanded action.
- Ecology regulates or authorizes the action.
- The action has the potential to cause measurable degradation to existing water quality at the edge of a chronic mixing zone..

Facility specific requirements – This facility must meet Tier I requirements.

- Dischargers must maintain and protect existing and designated uses. Ecology must not allow any degradation that will interfere with, or become injurious to, existing or designated uses, except as provided for in chapter 173-201A WAC.
- For waters that do not meet assigned criteria, or protect existing or designated uses, Ecology will take appropriate and definitive steps to bring the water quality back into compliance with the water quality standards.
- Ecology's analysis described in this section of the fact sheet demonstrates that the proposed permit conditions will protect existing and designated uses of the receiving water.

5. Mixing zones

A mixing zone is the defined area in the receiving water surrounding the discharge port(s), where wastewater mixes with receiving water. Within mixing zones the pollutant concentrations may exceed water quality numeric standards, so long as the discharge doesn't interfere with designated uses of the receiving water body (for example, recreation, water supply, and aquatic life and wildlife habitat, etc.) The pollutant concentrations outside of the mixing zones must meet water quality numeric standards.

State and federal rules allow mixing zones because the concentrations and effects of most pollutants diminish rapidly after discharge, due to dilution. Ecology defines mixing zone sizes to limit the amount of time any exposure to the end-of-pipe discharge could harm water quality, plants, or fish.

The state's water quality standards allow Ecology to authorize mixing zones for the facility's permitted wastewater discharges only if those discharges already receive all known, available, and reasonable methods of prevention, control, and treatment (AKART). Mixing zones typically require compliance with water quality criteria within a specified distance from the point of discharge and must not use

more than 25% of the available width of the water body for dilution (WAC 173-201A-400 (7)).

Ecology uses modeling to estimate the amount of mixing within the mixing zone. Through modeling Ecology determines the potential for violating the water quality standards at the edge of the mixing zone and derives any necessary effluent limits. Steady-state models are the most frequently used tools for conducting mixing zone analyses. Ecology chooses values for each effluent and for receiving water variables that correspond to the time period when the most critical condition is likely to occur. Each critical condition parameter, by itself, has a low probability of occurrence and the resulting dilution factor is conservative. The term “reasonable worst-case” applies to these values.

The mixing zone analysis produces a numerical value called a dilution factor (DF). A dilution factor represents the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. For example, a dilution factor of 4 means the effluent is 25% and the receiving water is 75% of the total volume of water at the boundary of the mixing zone. Ecology uses dilution factors with the water quality criteria to calculate reasonable potentials and effluent limits. Water quality standards include both aquatic life-based criteria and human health-based criteria. The former are applied at both the acute and chronic mixing zone boundaries; the latter are applied only at the chronic boundary. The concentration of pollutants at the boundaries of any of these mixing zones may not exceed the numerical criteria for that zone.

Each aquatic life acute criterion is based on the assumption that organisms are not exposed to that concentration for more than one hour and more often than one exposure in three years. Each aquatic life chronic criterion is based on the assumption that organisms are not exposed to that concentration for more than four consecutive days and more often than once in three years.

The two types of human health-based water quality criteria distinguish between those pollutants linked to non-cancer effects (non-carcinogenic) and those linked to cancer effects (carcinogenic). The human health-based water quality criteria incorporate several exposure and risk assumptions. These assumptions include:

- A 70-year lifetime of daily exposures.
- An ingestion rate for fish or shellfish measured in kg/day.
- An ingestion rate of two and four tenths (2.4) liters/day for drinking water (increased from two liters/day in the 2016 Water Quality Standards update).
- A one-in-one-million cancer risk for carcinogenic chemicals.

This permit authorizes a small acute mixing zone, surrounded by a chronic mixing zone around the point of discharge (WAC 173-201A-400). The water

quality standards impose certain conditions before allowing the discharger a mixing zone:

a. Ecology must specify both the allowed size and location in a permit.

The proposed permit specifies the size and location of the allowed mixing zone (as specified below).

b. The facility must fully apply "all known, available, and reasonable methods of prevention, control and treatment" (AKART) to its discharge.

Ecology has determined that the treatment provided at Pateros POTW meets the requirements of AKART (see "Technology-based Limits").

c. Ecology must consider critical discharge conditions.

Surface water quality-based limits are derived for the water body's critical condition (the receiving water and waste discharge condition with the highest potential for adverse impact on the aquatic biota, human health, and existing or designated waterbody uses). The critical discharge condition is often pollutant-specific or waterbody-specific.

Critical discharge conditions are those conditions that result in reduced dilution or increased effect of the pollutant. Factors affecting dilution include the depth of water, the density stratification in the water column, the currents, and the rate of discharge. Density stratification is determined by the salinity and temperature of the receiving water. Temperatures are warmer in the surface waters in summer. Therefore, density stratification is generally greatest during the summer months. Density stratification affects how far up in the water column a freshwater plume may rise. The rate of mixing is greatest when an effluent is rising. The effluent stops rising when the mixed effluent is the same density as the surrounding water. After the effluent stops rising, the rate of mixing is much more gradual. Water depth can affect dilution when a plume might rise to the surface when there is little or no stratification. Ecology uses the water depth at mean lower low water (MLLW) for marine waters. Ecology's ***Permit Writer's Manual*** (Ecology, 2018) describes additional guidance on criteria/design conditions for determining dilution factors.

Table 10 - Critical conditions used to model the discharge

Critical condition	Value
Seven-day-average low river flow with a recurrence interval of ten years (7Q10)	41,738 ft/s
River depth at the 7Q10 period	22.68 ft
River velocity	0.38 ft/s
Manning roughness coefficient	0.025
Channel width	1, 840 ft

Critical condition	Value
Maximum average monthly effluent flow for chronic and human health non-carcinogen	0.059 MGD
Maximum daily flow for acute mixing zone	0.0932 MGD
7-DAD MAX/1-DAD-MAX Effluent temperature	23 °C

Ecology obtained ambient data at critical conditions in the vicinity of the outfall from ambient station USGS Station 124380000 and Ecology EIM station 53A070 at The Coulee Dam Bridge, WA.

d. Supporting information must clearly indicate the mixing zone would not:

- Have a reasonable potential to cause the loss of sensitive or important habitat.
- Substantially interfere with the existing or characteristic uses.
- Result in damage to the ecosystem.
- Adversely affect public health.

Ecology established Washington State water quality criteria for toxic chemicals using EPA criteria. EPA developed the criteria using toxicity tests with numerous organisms and set the criteria to generally protect the species tested and to fully protect all commercially and recreationally important species.

EPA sets acute criteria for toxic chemicals assuming organisms are exposed to the pollutant at the criteria concentration for one hour. They set chronic standards assuming organisms are exposed to the pollutant at the criteria concentration for four days. Dilution modeling under critical conditions generally shows that both acute and chronic criteria concentrations are reached within minutes of discharge.

The discharge plume does not impact drifting and non-strong swimming organisms because they cannot stay in the plume close to the outfall long enough to be affected. Strong swimming fish could maintain a position within the plume, but they can also avoid the discharge by swimming away. Mixing zones generally do not affect benthic organisms (bottom dwellers) because the buoyant plume rises in the water column. Ecology has additionally determined that the effluent will not exceed 33 degrees C for more than two seconds after discharge; and that the temperature of the water will not create lethal conditions or blockages to fish migration.

Ecology evaluates the cumulative toxicity of an effluent by testing the discharge with whole effluent toxicity (WET) testing.

Ecology reviewed the above information, the specific information on the characteristics of the discharge, the receiving water characteristics and the discharge location. Based on this review, Ecology concluded that the discharge does not have a reasonable potential to cause the loss of sensitive or important habitat, substantially interfere with existing or characteristics uses, result in

damage to the ecosystem, or adversely affect public health if the permit limits are met.

e. The discharge/receiving water mixture must not exceed water quality criteria outside the boundary of a mixing zone.

Ecology conducted a reasonable potential analysis, using procedures established by the EPA and by Ecology, for each pollutant and concluded the discharge/receiving water mixture will not violate water quality criteria outside the boundary of the mixing zone if permit limits are met.

f. The size of the mixing zone and the concentrations of the pollutants must be minimized.

At any given time, the effluent plume uses only a portion of the acute and chronic mixing zone, which minimizes the volume of water involved in mixing. Because tidal currents change direction, the plume orientation within the mixing zone changes. The plume mixes as it rises through the water column therefore much of the receiving water volume at lower depths in the mixing zone is not mixed with discharge. Similarly, because the discharge may stop rising at some depth due to density stratification, waters above that depth will not mix with the discharge. Ecology determined it is impractical to specify in the permit the actual, much more limited volume in which the dilution occurs as the plume rises and moves with the current.

Ecology minimizes the size of mixing zones by requiring dischargers to install diffusers when they are appropriate to the discharge and the specific receiving waterbody. When a diffuser is installed, the discharge is more completely mixed with the receiving water in a shorter time. Ecology also minimizes the size of the mixing zone (in the form of the dilution factor) using design criteria with a low probability of occurrence. For example, Ecology uses the expected 95th percentile pollutant concentration, the 90th percentile background concentration, the centerline dilution factor, and the lowest flow occurring once in every ten years to perform the reasonable potential analysis.

Because of the above reasons, Ecology has effectively minimized the size of the mixing zone authorized in the proposed permit.

g. Maximum size of mixing zone.

The authorized mixing zone does not exceed the maximum size restriction.

h. Acute mixing zone.

- The discharge/receiving water mixture must comply with acute criteria as near to the point of discharge as practicably attainable.

Ecology determined the acute criteria will be met at 10% of the distance (or volume fraction) of the chronic mixing zone at the ten year low flow.

- The pollutant concentration, duration, and frequency of exposure to the discharge will not create a barrier to migration or translocation of indigenous organisms to a degree that has the potential to cause damage to the ecosystem.

As described above, the toxicity of any pollutant depends upon the exposure, the pollutant concentration, and the time the organism is exposed to that concentration. Authorizing a limited acute mixing zone for this discharge assures that it will not create a barrier to migration. The effluent from this discharge will rise as it enters the receiving water, assuring that the rising effluent will not cause translocation of indigenous organisms near the point of discharge (below the rising effluent).

- Comply with size restrictions.

The mixing zone authorized for this discharge complies with the size restrictions published in chapter 173-201A WAC.

i. Overlap of Mixing Zones.

This mixing zone does not overlap another mixing zone.

III.D. Designated uses and surface water quality criteria

Applicable designated uses and surface water quality criteria are defined in chapter 173-201A WAC. The table included below summarizes the criteria applicable to this facility's receiving water and its designated uses.

1. Freshwater aquatic life uses and associated criteria

Aquatic life uses are designated based on the presence of, or the intent to provide protection for the key uses. All indigenous fish and non-fish aquatic species must be protected in waters of the state in addition to the key species. The aquatic life uses for this receiving water are identified below.

Table 11 - Salmonid spawning, rearing, and migration

Criteria	Value
Temperature – Highest 7-DAD MAX	17.5°C (63.5°F)
Dissolved oxygen – Lowest 1-Day minimum	8.0 mg/L
Turbidity	5 NTU over background when the background is 50 NTU or less; or A 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
Total dissolved gas	Total dissolved gas must not exceed 110 percent of saturation at any point of sample collection.

Criteria	Value
pH	The pH must measure within the range of 6.5 to 8.5 with a human-caused variation within the above range of less than 0.5 units.

2. Recreational use and criteria
The recreational use for this receiving water is primary contact recreation. *E.coli* organism levels must not exceed a geometric mean value of 100 CFU or MPN per 100 mL, with no more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained within the averaging period exceeding 320 CFU or MPN per 100 mL.

3. Water supply uses
The water supply uses are domestic, agricultural, industrial, and stock watering.

4. Miscellaneous freshwater uses
The miscellaneous freshwater uses are wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics.

III.E. Water quality impairments

Ecology has not documented any water quality impairments in the receiving water in the vicinity of the outfall.

The Columbia River is listed on the current 303(d) and is impaired for Temperature. EPA has Ecology completed a Total Maximum Daily Load (TMDL) Analysis.

The TMDL includes waste load allocations (WLA) for (describe WLAs).

The Columbia and Lower Snake Rivers are listed on the state's polluted waters list for high water temperatures that are above Washington water quality standards and can harm salmon. Because the Columbia and Snake Rivers cross multiple state boundaries and span almost 900 miles, the federal Environmental Protection Agency (EPA) established the Columbia and Lower Snake Rivers Temperature Total Maximum Daily Load (TMDL)[1] on May 20, 2020 (USEPA Region 10, 2021). The TMDL includes a waste load allocation for August 13, 2021. The TMDL assigns a Wasteload Allocation (WLA) expressed as a Heat Load in kcal/day to all point source discharges to the Columbia River, including this facility. Bridgeport POTW has been assigned a heat load of 3.33E+07 kcal/day based on design criteria and past effluent monitoring data. The heat load is included in the permit as a limit, applying facility-wide from the months of June to October. The heat load is calculated as the product of the monthly average temperature and the monthly average flow, multiplied by a conversion factor of 3.78E+06 kcals/day/ (°C x MGD).

Table 12 – Water quality-based limits

[1] https://www.epa.gov/columbiariver/tmdl-temperature-columbia-and-lower-snake-rivers

Parameter	Average Monthly
Heat Load (TMDL-based)	8,910,000 kcal/day

This limit is expressed as 8.91E+06 in the TMDL documentation. It is written out in table 12 for simplicity and clarity.

III.F. Evaluation of surface water quality-based effluent limits for narrative criteria

Ecology must consider the narrative criteria described in WAC 173-201A-260 when it determines permit limits and conditions. Narrative water quality criteria limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge which have the potential to adversely affect designated uses, cause acute or chronic toxicity to biota, impair aesthetic values, or adversely affect human health.

Ecology considers narrative criteria when it evaluates the characteristics of the wastewater and when it implements all known, available, and reasonable methods of treatment and prevention (AKART) as described above in the technology-based limits section. When Ecology determines if a facility is meeting AKART it considers the pollutants in the wastewater and the adequacy of the treatment to prevent the violation of narrative criteria.

In addition, Ecology considers the toxicity of the wastewater discharge by requiring whole effluent toxicity (WET) testing when there is a reasonable potential for the discharge to contain toxics. Ecology's analysis of the need for WET testing for this discharge is described later in the fact sheet.

III.G. Evaluation of surface water quality-based effluent limits for numeric criteria

1. Mixing zones and dilution factors

Pollutants in an effluent may affect the aquatic environment near the point of discharge (near field) or at a considerable distance from the point of discharge (far field). Toxic pollutants, for example, are near-field pollutants; their adverse effects diminish rapidly with mixing in the receiving water. Conversely, a pollutant such as biological oxygen demand (BOD) is a far-field pollutant whose adverse effect occurs away from the discharge even after dilution has occurred. Thus, the method of calculating surface water quality based effluent limits varies with the point at which the pollutant has its maximum effect.

With technology-based controls (AKART), predicted pollutant concentrations in the discharge exceed water quality criteria. Ecology therefore authorizes a mixing zone in accordance with the geometric configuration, flow restriction, and other restrictions imposed on mixing zones by chapter 173-201A WAC.

The diffuser at Outfall 0001 is 500 feet long into the river with a diameter of 8 inches. The outfall is 60 feet below the high-water level of the river.

Chronic mixing zone – WAC 173-201A-400(7)(a) specifies that mixing zones must not extend in a downstream direction from the discharge ports for a distance greater than 300 feet plus the depth of water over the discharge ports or extend upstream for a distance of over 100 feet, not utilize greater than 25% of the flow, and not occupy greater than 25% of the width of the water body. The mixing zone extends from the bottom to the top of the water column.

The horizontal distance of the chronic mixing is 322.7 feet. The mixing zone extends from the bottom to the top of the water column.

Acute mixing zone – WAC 173-201A-400(8)(a) specifies that in rivers and streams a zone where acute toxics criteria may be exceeded must not extend beyond 10% of the distance towards the upstream and downstream boundaries of the chronic zone, not use greater than 2.5% of the flow and not occupy greater than 25% of the width of the water body. The mixing zone extends from the bottom to the top of the water column.

The acute dilution factor below is based on a downstream distance of 32.3 feet.

Table 13 - Dilution factors

Criteria	Acute	Chronic
Aquatic Life	19.1	245
Human Health, Carcinogen		245
Human Health, Non-carcinogen		245

Ecology determined the impacts of dissolved oxygen deficiency, nutrients, pH, fecal coliform, E.coli, enterococci, chlorine, ammonia, metals, other toxics, and temperature as described below, using the dilution factors in the above table. The derivation of surface water quality-based limits also takes into account the variability of pollutant concentrations in both the effluent and the receiving water.

2. Dissolved Oxygen: BOD_5 and Ammonia Effects

Natural decomposition of organic material in wastewater effluent impacts dissolved oxygen in the receiving water at distances far outside of the regulated mixing zone. The 5-day Biochemical Oxygen Demand (BOD_5) of an effluent sample indicates the amount of biodegradable material in the wastewater and estimates the magnitude of oxygen consumption the wastewater will generate in the receiving water. The amount of ammonia-based nitrogen in the wastewater also provides an indication of oxygen demand in the receiving water.

Ecology modeled the impact of BOD_5 on the receiving water and with the technology-based effluent limit for BOD_5 described under "Technology-Based Effluent Limits" above. The calculations to determine dissolved oxygen impacts are shown in Appendix D.

Ecology predicted no violation of the surface water quality standards for dissolved oxygen at the edge of the mixing zone due to the impacts of

biochemical oxygen demand (BOD_5) under critical conditions. Therefore, the proposed permit contains the technology-based effluent limit for BOD_5. The permit also does not contain a limit on ammonia based on dissolved oxygen impacts (ammonia toxicity is examined elsewhere in this fact sheet).

3. pH

Ecology modeled the impact to receiving waters under critical conditions using technology-based limits for pH (6.0 – 9.0) and the *pH-mix-fresh* worksheet in Ecology's PermitCalc spreadsheet. Appendix D includes the model results. Model calculations predict no violation of the pH criteria under critical conditions. The proposed permit includes technology-based limits for pH.

4. Bacteria

In the previous permit cycle, Ecology modeled the number of fecal coliform by simple mixing analysis using the technology-based limit of 400 organisms per 100 mL. That analysis showed no violation of the fecal coliform recreational use criterion under critical conditions. The domestic technology-based limits for fecal coliform in WAC 173-221 are still in effect. Without effluent data for *E.coli*, Ecology cannot determine whether the discharge will violate the recreational use criterion for *E.coli*. Given that the characteristics of the receiving water and the discharge have not changed substantially since the analysis conducted in the previous permit cycle, and the transition is a change in bacterial indicator not more or less stringent than the previous criterion, the proposed permit will maintain the technology-based effluent limit for fecal coliform. In addition, the permittee will be required to monitor for both fecal coliform and *E. coli*. Ecology will then use this data to assess the reasonable potential to exceed the applicable recreational use criterion in the next iteration of this permit.

5. Turbidity

Ecology evaluated the impact of turbidity based on the range of turbidity in the effluent and turbidity of the receiving water. Ecology expects no violations of the turbidity criteria outside the designated mixing zone provided the facility meets its technology-based total suspended solids permit limits.

6. Toxic pollutants – aquatic life criteria

Federal regulations at 40 CFR 122.44 require Ecology to place limits in NPDES permits on toxic chemicals in an effluent whenever there is a reasonable potential for those chemicals to exceed the surface water quality criteria. Ecology does not exempt facilities with technology-based effluent limits from meeting the surface water quality standards.

The following toxic pollutants are present in the discharge: ammonia. Ecology conducted a reasonable potential analysis (See Appendix D) on these parameters to determine whether it would require effluent limits in this permit.

Ammonia's toxicity depends on that portion which is available in the unionized form. The amount of unionized ammonia depends on the temperature and pH in the receiving freshwater. To evaluate ammonia toxicity, Ecology used the available receiving water information for ambient station USGS station 124380000 and Ecology EIM station 53A070 at the Coulee Dam Bridge, WA, and Ecology spreadsheet tools.

Valid ambient background data were available for ammonia. Ecology used all applicable data to evaluate reasonable potential for this discharge to cause a violation of water quality standards.

Ecology determined that ammonia pose no reasonable potential to cause or contribute to exceedances of the water quality criteria at the critical conditions using procedures given in the ***Technical Support Document for Water Quality-Based Toxics Control*** (EPA/505/2-90-001) (USEPA, 1991) (Appendix D) and as described above. Ecology's determination assumes that this facility meets the other effluent limits of this permit.

7. Temperature

The state temperature standards (WAC 173-201A, WAC 173-201A-200, WAC 173-201A-600, and WAC 173-201A-602) include multiple elements:

a. Annual summer maximum threshold criteria (June 15 to September 15)
b. Supplemental spawning and rearing season criteria (September 15 to June 15)
c. Incremental warming restrictions
d. Guidelines on preventing acute lethality and barriers to migration of salmonids

Ecology evaluates each criterion independently to determine reasonable potential and derive permit limits.

a. Annual summer maximum and supplementary spawning/rearing criteria

Each water body has an annual maximum temperature criterion [WAC 173-201A-200(1)(c), and WAC 173-201A-602, Table 602]. These threshold criteria (e.g., 12, 16, 17.5, 20°C) protect specific categories of aquatic life by controlling the effect of human actions on summer temperatures.

Some waters have an additional threshold criterion to protect the spawning and incubation of salmonids (9°C for char and 13°C for salmon and trout) [WAC 173-201A-602, Table 602]. These criteria apply during specific date-windows.

The threshold criteria apply at the edge of the chronic mixing zone. Criteria for most fresh waters are expressed as the highest 7-Day average of daily maximum temperature (7-DADMax). The 7-DADMax temperature is the arithmetic average of seven consecutive measures of daily maximum temperatures. Criteria for

some fresh waters are expressed as the highest 1-Day annual maximum temperature (1-DMax).

b. Incremental warming criteria

The water quality standards limit the amount of warming human sources can cause under specific situations [WAC 173-201A-200(1)(c)(i)-(ii)]. The incremental warming criteria apply at the edge of the chronic mixing zone.

At locations and times when background temperatures are cooler than the assigned threshold criterion, point sources are permitted to warm the water by only a defined increment. These increments are permitted only to the extent doing so does not cause temperatures to exceed either the annual maximum or supplemental spawning criteria.

c. Guidelines to prevent acute lethality or barriers to migration of salmonids. These site-level considerations do not override the temperature criteria listed above.
   i. Instantaneous lethality to passing fish: The upper 99th percentile daily maximum effluent temperature must not exceed 33°C, unless a dilution analysis indicates ambient temperatures will not exceed 33°C two seconds after discharge.
   ii. General lethality and migration blockage: The temperature at the edge of a chronic mixing zone must not exceed either a 1DMax of 23°C or a 7DADMax of 22°C. When adjacent downstream temperatures are 3°C or more cooler, the 1DMax at the edge of the chronic mixing zone must not exceed 22°C.
   iii. Lethality to incubating fish: The temperature must not exceed 17.5°C at locations where eggs are incubating.

Reasonable potential analysis

EPA has completed a temperature TMDL and established a wasteload allocation for this discharge. The proposed permit includes an effluent limit for temperature derived from the completed TMDL.

III.H. Evaluation of human health-based water quality criteria

Washington's water quality standards include numeric human health-based criteria for priority pollutants that Ecology must consider when writing NPDES permits.

Ecology determined the applicant's is unlikely to contain chemicals regulated to protect human health. Ecology will reevaluate this discharge for impacts to human health at the next permit reissuance.

III.I. Sediment quality

The aquatic sediment standards (chapter 173-204 WAC) protect aquatic biota and human health. Under these standards Ecology may require a facility to evaluate the

potential for its discharge to cause a violation of sediment standards (WAC 173-204-400). You can obtain additional information about sediments at the Aquatic Lands Cleanup Unit website[2].

Through a review of the discharger characteristics and of the effluent characteristics, Ecology determined that this discharge has no reasonable potential to violate the sediment management standards.

III.J. Groundwater quality limits

The groundwater quality standards (chapter 173-200 WAC) protect beneficial uses of groundwater. Permits issued by Ecology must not allow violations of those standards (WAC 173-200-100).

Pateros POTW does not discharge wastewater to the ground. No permit limits are required to protect groundwater.

III.K. Whole effluent toxicity

The water quality standards for surface waters forbid discharge of effluent that has the potential to cause toxic effects in the receiving waters. Many toxic pollutants cannot be measured by commonly available detection methods. However, laboratory tests can measure toxicity directly by exposing living organisms to the wastewater and measuring their responses. These tests measure the aggregate toxicity of the whole effluent, so this approach is called whole effluent toxicity (WET) testing. Some WET tests measure acute toxicity and other WET tests measure chronic toxicity.

Using the screening criteria in chapter 173-205-040 WAC, Ecology determined that toxic effects caused by unidentified pollutants in the effluent are unlikely. Therefore, this permit does not require WET testing. Ecology may require WET testing in the future if it receives information indicating that toxicity may be present in this effluent.

III.L. Comparison of effluent limits with the previous permit issued April 1, 2015.

Table 14 - Comparison of previous and proposed effluent limits – Outfall 001

Limit	Basis of Limit	Existing permit limit	Proposed permit limit
Biochemical Oxygen Demand (5-day) – Average Monthly	Technology	30 mg/L 24.6 lbs/day	30 mg/L 24.6 lbs/day
Biochemical Oxygen Demand (5-day) – Average Monthly – Average Weekly	Technology	45 mg/L 36.9 lbs/day	45 mg/L 36.9 lbs/day
Total Suspended Solids – Average Monthly	Technology	30 mg/L 24.6 lbs/day	30 mg/L 24.6 lbs/day
Total Suspended Solids – Average Weekly	Technology	45 mg/L 37.9 lbs/day	45 mg/L 37.9 lbs/day
Fecal Coliform Bacteria – Monthly Geometric Mean	Technology	100 CFUs/100mL	100 CFUs/100mL

[2] https://ecology.wa.gov/Spills-Cleanup/Contamination-cleanup/Sediment-cleanups

Limit	Basis of Limit	Existing permit limit	Proposed permit limit
Fecal Coliform Bacteria – Weekly Geometric Mean	Technology	200 CFUs/100mL	200 CFUs/100mL
pH – Daily Minimum	Technology	6.0 S.U.	6.0 S.U.
pH – Daily Maximum	Technology	9.0 S.U.	9.0 S.U.
Temperature (Heat Load)	Water Quality (TMDL)	N/A	8.91E+06 kcal/day

IV. Monitoring requirements

Ecology requires monitoring, recording, and reporting (WAC 173-220-210 and 40 CFR 122.41) to verify that the treatment process is functioning correctly and that the discharge complies with the permit's effluent limits.

If a facility uses a contract laboratory to monitor wastewater, it must ensure that the laboratory uses the methods and meets or exceeds the method detection levels required by the permit. The permit describes when facilities may use alternative methods. It also describes what to do in certain situations when the laboratory encounters matrix effects. When a facility uses an alternative method as allowed by the permit, it must report the test method, detection level (DL), and quantitation level (QL) on the discharge monitoring report or in the required report.

IV.A. Wastewater monitoring

The monitoring schedule is detailed in the proposed permit under Special Condition S.2. Specified monitoring frequencies consider the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring. The required monitoring frequency is consistent with agency guidance given in the current version of Ecology's ***Permit Writer's Manual,*** Publication 92-109 (Ecology, 2018) for Aeromod Activated Sludge Facility.

Ecology has included some additional monitoring of nutrients in the proposed permit to establish a baseline for this discharger. It will use this data in the future as it develops TMDLs for dissolved oxygen and establishes WLAs for nutrients.

Monitoring of sludge quantity and quality is necessary to determine the appropriate uses of the sludge. Biosolids monitoring is required by the current state and local solid waste management program and by EPA under 40 CFR 503.

Ecology has required monitoring of both fecal coliform and *E. coli* in the permit application. This dual monitoring will help inform both Ecology and Pateros POTW of the correlation between the two indicators. Dual monitoring requirements consist of annual sampling for E. coli, with this sampling occurring on the same day a required fecal coliform sample is taken.

IV.B. Lab accreditation

Ecology requires that facilities must use a laboratory registered or accredited under the provisions of chapter 173-50 WAC, Accreditation of Environmental Laboratories,

to prepare all monitoring data (with the exception of certain parameters). Ecology accredited the laboratory at this facility listed in table below.

Table 15 - Accredited parameters

Parameter name	Category	Method name	Matrix description
TSS	General Chemistry	SM 2540 D-2011	Non-Potable Water
pH	General Chemistry	SM 4500-H+ B-2011	Non-Potable Water
DO	General Chemistry	Hach 10360 rev 1.2	Non-Potable Water
BOD-5	General Chemistry	SM 5210 B-2011	Non-Potable Water
Fecal Coliform	Microbiology	SM 9222 D (mFC)-06	Non-Potable Water

IV.C. Effluent limits which are near detection or quantitation levels

The water quality-based effluent concentration limits are near the limits of current analytical methods to detect or accurately quantify. The method detection level (MDL) also known as detection level (DL) is the minimum concentration of a pollutant that a laboratory can measure and report with a 99 percent confidence that its concentration is greater than zero (as determined by a specific laboratory method). The quantitation level (QL) is the level at which a laboratory can reliably report concentrations with a specified level of error. Estimated concentrations are the values between the DL and the QL. Ecology requires permitted facilities to report estimated concentrations. When reporting maximum daily effluent concentrations, Ecology requires the facility to report "less than X" where X is the required detection level if the measured effluent concentration falls below the detection level.

V. Other permit conditions

V.A. Reporting and record keeping

Ecology based Special Condition S3 on its authority to specify any appropriate reporting and record keeping requirements to prevent and control waste discharges (WAC 173-220-210).

V.B. Prevention of facility overloading

Overloading of the treatment plant is a violation of the terms and conditions of the permit. To prevent this from occurring, RCW 90.48.110 and WAC 173-220-150 require Pateros POTW to:

- Take the actions detailed in proposed permit Special Condition S.4.
- Design and construct expansions or modifications before the treatment plant reaches existing capacity.
- Report and correct conditions that could result in new or increased discharges of pollutants.

Special Condition S.4 restricts the amount of flow.

The municipality should contact Ecology's regional office as early as practical before planning a project that may include Ecology-administered funding.

V.C. Operation and maintenance

The proposed permit contains Special Condition S.5 as authorized under RCW 90.48.110, WAC 173-220-150, chapter 173-230 WAC, and WAC 173-240-080. Ecology included it to ensure proper operation and regular maintenance of equipment, and to ensure that Pateros POTW takes adequate safeguards so that it uses constructed facilities to their optimum potential in terms of pollutant capture and treatment.

Special Condition S.5 requires facility name to review and update as needed an operation and maintenance manual as required by state regulation for the construction of wastewater treatment facilities (WAC 173-240-080). Implementation of the procedures in the operation and maintenance manual ensures the facility's compliance with the terms and limits in the permit.

Pateros POTW has documented or suspects inflow, infiltration, overflows, failures in its collection system and it needs to further characterize the problem. Significant portions of the collection system were originally installed in 1954 and expanded in 1966 constructed using techniques such as concrete pipes with oakum packing and/or have numerous manholes, which were not installed using modern materials. Ecology expects leaks are present in the collection system due to its age, materials used, and construction methods for its installation. Therefore, the proposed permit requires the Pateros POTW to characterize the collection system for the presence of leaks by providing the following information:

- Volume of the annual average and peak daily flow under worst conditions (inflow or infiltration) attributed to leaks.
- Location of leaks.
- Volume of excess flow contributed by a run of sewer or other defined area such as a sewer system sub-basin.

Three good references to aid in these tasks include:

- ***Existing Sewer Evaluation and Rehabilitation: Manual of Practice FD 6*** (Water Environment Federation, American Society of Civil Engineers, 2020)
- ***Handbook for Sewer System Infrastructure Analysis and Rehabilitation***, EPA/625/6-91/030 (USEPA, 1991)
- ***Standard Specifications for Road, Bridge, and Municipal Construction***, M 41-10 (Washington State Department of Transportation, 2023)

Following characterization of the leaks, Ecology may require corrective actions by issuing an administrative order following review of the assessment.

V.D. Pretreatment

Ecology administers the National Pretreatment Program under the terms of the "National Pollutant Discharge Elimination System (NPDES) Memorandum of Agreement Between the State of Washington and the United States Environmental

Protection Agency Region 10" (1986), including any revisions, modifications, or amendments to the Memorandum of Agreement, and 40 CFR Part 403.

Under this delegation of authority, Ecology will serve as either: a) the Control Authority for those industrial users who introduce pollutants into a POTW which has not been approved to have a Pretreatment Program or b) the Approval Authority for an approved Pretreatment Program.

The City of Pateros does not have an approved pretreatment program. Therefore, Ecology acts as the Control Authority pursuant to 40 CFR Part 403.10(e). In the City of Pateros sewer service area, in accordance with WAC 173-216, Ecology issues permits for the wastewater discharges from the nondomestic.

1. Duty to enforce discharge prohibitions

This provision prohibits the publicly owned treatment works (POTW) from authorizing, permitting, or allowing an industrial discharger to discharge certain types of waste into the sanitary sewer.

- The first section prohibits the POTW from accepting pollutants which causes “pass through” or “interference”. This general prohibition is from 40 CFR §403.5(a). Appendix C of this fact sheet defines these terms.
- The second section reinforces specific state and federal pretreatment prohibitions found in 40 CFR §403.5(b) and WAC 173-216-060 . The POTW may not accept wastes which violate the specific state and federal discharge prohibitions. Wastewaters with the following characteristics are prohibited:
    - Wastewaters prohibited to be discharged by the Dangerous Waste Regulations in 173-303 WAC.
    - Explosive or flammable.
    - Have too high or low of a pH (too corrosive, acidic or basic).
    - May cause a blockage such as grease, sand, rocks, or viscous materials.
    - Heat in amounts that will inhibit biological activity at the POTW.
    - Are of sufficient strength or volume to interfere with treatment.
    - Contain too much petroleum-based oils, mineral oil, or cutting fluid.
    - Create noxious or toxic gases at any point.
- The third section reflects state prohibitions [WAC 173-216-060(2)(b)(vii)] on the POTW accepting certain types of discharges unless the discharge has received prior written authorization from Ecology. These discharges include:
    - Cooling water in significant volumes.
    - Stormwater and other direct inflow sources.

- Wastewaters significantly affecting system hydraulic loading, which do not require treatment.

2. Requirements for performing an industrial user survey

The Pateros POTW serves many other industrial and commercial users, some of which have the potential to be or become, with changed processes, significant industrial users [40 CFR §403.3(v)]. A significant industrial user is a nondomestic indirect discharger (user) subject to categorical pretreatment standards under 40 CFR §403.6 and 40 CFR Chapter I, Subchapter N or any other nondomestic indirect discharger that meets any of the following:

- Discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blowdown wastewater).
- Contributes a process wastestream that makes up 5% or more of the average dry weather hydraulic or organic capacity of the POTW.
- Is designated as such by the Permittee or Ecology on the basis that the nondomestic indirect discharger has a reasonable potential to adversely affect the POTW's operation.

The purpose of the IU Survey is to identify all facilities that may be subject to pretreatment standards or requirements so that Ecology can take appropriate measures to control these discharges. The steps the POTW must document in their IU Survey submittal include:

d. The POTW must develop a master list of nondomestic users (commercial and industrial).This list must be based on several sources of information including business licenses, and water and sewer billing records.
e. The POTW must canvas all the potential sources. The POTW must identify categories of nondomestic users and have potentially significant users complete a survey form.
f. The POTW must identify SIUs in all areas served by the POTW.

Ecology uses the industrial user survey as a major mechanism to determine which nondomestic users merit further controls, such as a state waste discharge permit. Ecology describes the information needed in the survey submittal to allow Ecology to make permitting decision in the manual “Performing an Industrial User Survey”. Where surveys are incomplete, Ecology may take such enforcement as appropriate and/or require the POTW to develop a fully delegated pretreatment program.

The proposed permit requires Pateros POTW to conduct an industrial user survey to determine the extent of compliance of all industrial users of the sanitary sewer and wastewater treatment facility with federal pretreatment regulations [40 CFR Part 403 and CWA Sections 307(b) and CWA Section 308)], with state regulations (chapter 90.48 RCW and chapter 173-216 WAC), and with local ordinances.

3. Identification of new nondomestic wastewater sources and notification of permit requirements

The permit requires non-delegated POTWs to take "continuous, routine measures to identify and authorize nondomestic wastewater discharges. Examples of such routine measures include regular review of business license and building permit applications, advertisements, and personal reconnaissance. Collection system operators should be trained on what to look for so they can identify and report new industrial dischargers. The City of Pateros may not allow SIUs to discharge prior to receiving a permit from Ecology and must notify all industrial users of their responsibility to apply for a State Waste Discharge Permit. The POTW must also notify Ecology.

V.E. Spill plan

This facility stores a quantity of chemicals on-site that have the potential to cause water pollution if accidentally released. Ecology can require a facility to develop best management plans to prevent this accidental release [Section 402(a)(1) of the Federal Water Pollution Control Act (FWPCA) and RCW 90.48.080].

The proposed permit requires this facility to develop and implement a plan for preventing the accidental release of pollutants to state waters and for minimizing damages if such a spill occurs.

V.F. Solid waste

To prevent water quality problems the facility is required in permit Special Condition S7 to store and handle all residual solids (grit, screenings, scum, sludge, and other solid waste) in accordance with the requirements of RCW 90.48.080 and state water quality standards.

The final use and disposal of sewage sludge from this facility is regulated by U.S. EPA under 40 CFR 503, and by Ecology under chapter 70.95J RCW, chapter 173-308 WAC "Biosolids Management," and chapter 173-350 WAC "Solid Waste Handling Standards." The disposal of other solid waste is under the jurisdiction of the Okanogan County Health Department.

Requirements for monitoring sewage sludge and record keeping are included in this permit. Ecology will use this information, required under 40 CFR 503, to develop or update local limits.

V.G. Outfall evaluation

The proposed permit requires Pateros POTW to conduct an outfall inspection and submit a report detailing the findings of that inspection. The inspection must evaluate the physical condition of the discharge pipe and diffusers, and evaluate the extent of sediment accumulations in the vicinity of the outfall.

V.H. General conditions

Ecology bases the standardized General Conditions on state and federal law and regulations. They are included in all individual domestic wastewater NPDES permits issued by Ecology.

VI. Permit issuance procedures

VI.A. Permit modifications

Ecology may modify this permit to impose numeric limits, if necessary to comply with water quality standards for surface waters, with sediment quality standards, or with water quality standards for groundwaters, after obtaining new information from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies.

Ecology may also modify this permit to comply with new or amended state or federal regulations.

VI.B. Proposed permit issuance

This proposed permit includes all statutory requirements for Ecology to authorize a wastewater discharge. The permit includes limits and conditions to protect human health and aquatic life, and the beneficial uses of waters of the state of Washington. Ecology proposes to issue this permit for a term of five years.

VII. References for text and appendices

Ecology. (2011). *Waters Requiring Supplemental Spawning and Incubation Protection for Salmonid Species.* Publication 06-10-038. Retrieved from https://apps.ecology.wa.gov/publications/documents/0610038.pdf

Ecology. (2016). *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria (Publication 95-80).* Retrieved from https://apps.ecology.wa.gov/publications/SummaryPages/9580.html

Ecology. (2018). *Water Quality Program Permit Writer's Manual.* Publication 92-109. Retrieved from https://apps.ecology.wa.gov/publications/summarypages/92109.html

Ecology and Department of Health. (2019). *Reclaimed Water Facilities Manual: The Purple Book.* Retrieved from https://apps.ecology.wa.gov/publications/SummaryPages/1510024.html

Lewis, E. W. (1998). *Program developed for CO2 system calculations.* Retrieved from https://doi.org/10.2172/639712

Metcalf & Eddy, Inc. (1991). *Wastewater engineering : treatment, disposal, and reuse.* New York: McGraw-Hill.

USEPA. (1985). *Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water. Part 2,, EPA/600/6-85/002B.*

USEPA. (1987). *Enhanced Stream Water Quality Models QUAL2E and QUAL2E-UNCAS: Documentation and User Manual, EPA/600/3-87/007.*

USEPA. (1988). *Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling.*

USEPA. (1989). *Ambient Water Quality for Ammonia (Saltwater), EPA 440/5-88-004.*

USEPA. (1991). *Handbook: Sewer System Infrastructure Analysis and Rehabilitation, EPA/625/6-91/030.* Retrieved from https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NRMRL&dirEntryId=124654

USEPA. (1991). *Technical Support Document for Water Quality-Based Toxics Control (EPA/505/2-90-001).* Washington, DC. Retrieved from https://www3.epa.gov/npdes/pubs/owm0264.pdf

USEPA Region 10. (2021). *Columbia and Lower Snake Rivers Temperature Total Maximum Daily Load.* Seattle, WA.

Washington State Department of Transportation. (2023). *Standard Specifications for Road, Bridge, and Municipal Construction, M 41-10.* Retrieved from https://www.wsdot.wa.gov/publications/manuals/fulltext/M41-10/SS.pdf

Water Environment Federation, American Society of Civil Engineers. (2020). *Existing Sewer Evaluation and Rehabilitation: Manual of Practice FD 6.*

Water Pollution Control Federation. (1976). *Chlorination of Wastewater.*

Washington State and Ecology website general reference links:

Laws and Regulations[3]

Permit and Wastewater Related Information[4]

[3] http://leg.wa.gov/LawsAndAgencyRules/Pages/default.aspx
[4] https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Water-quality-permits-guidance

Appendix A – Public Involvement Information

Ecology proposes to reissue a permit to The City of Pateros POTW. The permit includes wastewater discharge limits and other conditions. This fact sheet describes the facility and Ecology's reasons for requiring permit conditions.

Ecology placed a Public Notice of Application on date and date in name of publication to inform the public about the submitted application and to invite comment on the reissuance of this permit.

Ecology will place a Public Notice of Draft on date in name of publication to inform the public and to invite comment on the proposed draft National Pollutant Discharge Elimination System permit and fact sheet.

The notice:

- Tells where copies of the draft Permit and Fact Sheet are available for public evaluation (a local public library, the closest Regional or Field Office, posted on our website).
- Offers to provide the documents in an alternate format to accommodate special needs.
- Urges people to submit their comments, in writing, before the end of the Comment Period
- Tells how to request a public hearing of comments about the proposed NPDES permit.
- Explains the next step(s) in the permitting process.

[Attach printed copy of the Public Notice mail-out]

Frequently Asked Questions about Effective Public Commenting[5]

You may obtain further information from Ecology by telephone, (509) 379-3967, or by writing to the address listed below.

Water Quality Permit Coordinator Department of Ecology

Central Regional Office
1250 West Alder Street
Union Gap, WA 98903

The primary author of this permit and fact sheet is Lucila (Lucy) Cornejo.

[5] https://apps.ecology.wa.gov/publications/SummaryPages/0307023.html

Appendix B – Your Right to Appeal

You have a right to appeal this permit to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of the final permit. The appeal process is governed by chapter 43.21B RCW and chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2) (see glossary).

To appeal you must do the following within 30 days of the date of receipt of this permit:

- File your appeal and a copy of this permit with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours as defined in WAC 371-08-305 and -335. "Notice of appeal" is defined in WAC 371-08-340.
- Serve a copy of your appeal and this permit on Ecology on the Department of Ecology mail, in person, or by email (see addresses below).
- You must also comply with other applicable requirements in chapter 43.21B RCW and chapter 371-08 WAC.

Filing with the PCHB

For the most current information regarding filing with the PCHB:
visit https://eluho.wa.gov/[6] or call 360-664-9160.

Service on Ecology

Street Address:

Department of Ecology
Attn: Appeals Processing Desk
300 Desmond Drive SE
Lacey, WA 98503

Mailing Address:

Department of Ecology
Attn: Appeals Processing Desk
PO Box 47608
Olympia, WA 98504-7608

E-Mail Address:

ecologyappeals@ecy.wa.gov

[6] https://eluho.wa.gov/

Appendix C – Glossary

1-DMax or 1-day maximum temperature – The highest water temperature reached on any given day. This measure can be obtained using calibrated maximum/minimum thermometers or continuous monitoring probes having sampling intervals of thirty minutes or less.

7-DADMax or 7-day average of the daily maximum temperatures – The arithmetic average of seven consecutive measures of daily maximum temperatures. The 7-DADMax for any individual day is calculated by averaging that day's daily maximum temperature with the daily maximum temperatures of the three days prior and the three days after that date.

Acute toxicity – The lethal effect of a compound on an organism that occurs in a short time period, usually 48 to 96 hours.

AKART – The acronym for "all known, available, and reasonable methods of prevention, control and treatment." AKART is a technology-based approach to limiting pollutants from wastewater discharges, which requires an engineering judgment and an economic judgment. AKART must be applied to all wastes and contaminants prior to entry into waters of the state in accordance with RCW 90.48.010 and RCW 90.48.520, WAC 173-200-030(2)(c)(ii), and WAC 173-216-110(1)(a).

Alternate point of compliance – An alternative location in the groundwater from the point of compliance where compliance with the groundwater standards is measured. It may be established in the groundwater at locations some distance from the discharge source, up to, but not exceeding the property boundary and is determined on a site specific basis following an AKART analysis. An "early warning value" must be used when an alternate point is established. An alternate point of compliance must be determined and approved in accordance with WAC 173-200-060(2).

Ambient water quality – The existing environmental condition of the water in a receiving water body.

Ammonia – Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

Annual average design flow (AADF) – average of the daily flow volumes anticipated to occur over a calendar year.

Average monthly (intermittent) discharge limit – The average of the measured values obtained over a calendar months' time taking into account zero discharge days.

Average monthly discharge limit – The average of the measured values obtained over a calendar months' time.

Background water quality – The concentrations of chemical, physical, biological or radiological constituents or other characteristics in or of groundwater at a particular point in time upgradient of an activity that has not been affected by that activity, [WAC 173-200-020(3)]. Background water quality for any parameter is statistically defined as the 95% upper tolerance interval with a 95% confidence based on at least eight hydraulically upgradient water quality samples. The eight samples are collected over a period of at least one year, with no more than one sample collected during any month in a single calendar year.

Best management practices (BMPs) – Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the state. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD_5 – Determining the five-day Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD_5 is used in modeling to measure the reduction of dissolved oxygen in receiving waters after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD_5 is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

Bypass – The intentional diversion of waste streams from any portion of a treatment facility.

Categorical pretreatment standards – National pretreatment standards specifying quantities or concentrations of pollutants or pollutant properties, which may be discharged to a POTW by existing or new industrial users in specific industrial subcategories.

Chlorine – A chemical used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

Chronic toxicity – The effect of a compound on an organism over a relatively long time, often 1/10 of an organism's lifespan or more. Chronic toxicity can measure survival, reproduction or growth rates, or other parameters to measure the toxic effects of a compound or combination of compounds.

Clean water act (CWA) – The federal Water Pollution Control Act enacted by Public Law 92 500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

Compliance inspection-without sampling – A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance inspection-with sampling – A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations. In addition it includes as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the 85 percent removal requirement. Ecology may conduct additional sampling.

Composite sample – A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples. May be "time-composite" (collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots).

Construction activity – Clearing, grading, excavation, and any other activity, which disturbs the surface of the land. Such activities may include road building; construction of residential houses, office buildings, or industrial buildings; and demolition activity.

Continuous monitoring – Uninterrupted, unless otherwise noted in the permit.

Critical condition – The time during which the combination of receiving water and waste discharge conditions have the highest potential for causing toxicity in the receiving water environment. This situation usually occurs when the flow within a water body is low, thus, its ability to dilute effluent is reduced.

Date of receipt – This is defined in RCW 43.21B.001(2) as five business days after the date of mailing; or the date of actual receipt, when the actual receipt date can be proven by a preponderance of the evidence. The recipient's sworn affidavit or declaration indicating the date of receipt, which is unchallenged by the agency, constitutes sufficient evidence of actual receipt. The date of actual receipt, however, may not exceed forty-five days from the date of mailing.

Days (compliance period interval) – When the compliance period is stated in days: (A) exclude the day of the event that triggers the period; (B) count every day, including intermediate Saturdays, Sundays, and legal holidays; and (C) include the last day of the period, but if the last day is a Saturday, Sunday, or legal holiday, the period continues to run until the end of the next day that is not a Saturday, Sunday, or legal holiday.

Detection level – or method detection limit means the minimum concentration of an analyte (substance) that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results as determined by the procedure given in 40 CFR part 136, Appendix B.

Dilution factor (DF) – A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the percent effluent fraction, for example, a dilution factor of 10 means the effluent comprises 10% by volume and the receiving water 90%.

Distribution uniformity – The uniformity of infiltration (or application in the case of sprinkle or trickle irrigation) throughout the field expressed as a percent relating to the average depth infiltrated in the lowest one-quarter of the area to the average depth of water infiltrated.

Early warning value – The concentration of a pollutant set in accordance with WAC 173-200-070 that is a percentage of an enforcement limit. It may be established in the effluent, groundwater, surface water, the vadose zone or within the treatment process. This value acts as a trigger to detect and respond to increasing contaminant concentrations prior to the degradation of a beneficial use.

Enforcement limit – The concentration assigned to a contaminant in the groundwater at the point of compliance for the purpose of regulation, [WAC 173-200-020(11)]. This limit assures that a groundwater criterion will not be exceeded and that background water quality will be protected.

Engineering report – A document that thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report must contain the appropriate information required in WAC 173-240-060 or WAC 173-240-130.

Enterococci – A subgroup of fecal streptococci that includes *S. faecalis*, *S. faecium*, *S. gallinarum*, and *S. avium*. The enterococci are differentiated from other streptococci by their ability to grow in 6.5% sodium chloride, at pH 9.6, and at 10°C and 45°C.

E. coli – A bacterium in the family Enterobacteriaceae named Escherichia coli and is a common inhabitant of the intestinal tract of warm-blooded animals, and its presence in water samples is an indication of fecal pollution and the possible presence of enteric pathogens.

Fecal coliform bacteria – Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

Grab sample – A single sample or measurement taken at a specific time or over as short a period of time as is feasible.

Groundwater – Water in a saturated zone or stratum beneath the surface of land or below a surface water body.

Immediate reporting – Report permit violations immediately without delay of any interval of time from the moment the permittee becomes aware of the violation. Priority should first be given to stopping an active noncompliance.

Industrial user – A discharger of wastewater to the sanitary sewer that is not sanitary wastewater or is not equivalent to sanitary wastewater in character.

Industrial wastewater – Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business; from the development of any natural resource; or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated stormwater and, also, leachate from solid waste facilities.

Interference – A discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

- Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and
- Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to subtitle D of the SWDA), sludge regulations appearing in 40 CFR Part 507, the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

Local limits – Specific prohibitions or limits on pollutants or pollutant parameters developed by a POTW.

Major facility – A facility discharging to surface water with an EPA rating score of > 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Maximum daily discharge limit – The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

Maximum day design flow (MDDF) – The largest volume of flow anticipated to occur during a one-day period, expressed as a daily average.

Maximum month design flow (MMDF) – The largest volume of flow anticipated to occur during a continuous 30-day period, expressed as a daily average.

Maximum week design flow (MWDF) – The largest volume of flow anticipated to occur during a continuous 7-day period, expressed as a daily average.

Method detection limit (MDL) – See Detection level.

Minor facility -- A facility discharging to surface water with an EPA rating score of < 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Mixing zone – An area that surrounds an effluent discharge within which water quality criteria may be exceeded. The permit specifies the area of the authorized mixing zone that Ecology defines following procedures outlined in state regulations (chapter 173-201A WAC).

National pollutant discharge elimination system (NPDES) – Section 402 of the Clean Water Act, the federal wastewater permitting system for discharges to navigable waters of the United States. Many states, including the state of Washington, have been delegated the authority to issue these permits. NPDES permits issued by Washington State are joint NPDES/State permits issued under both state and federal laws.

pH – The pH of a liquid measures its acidity or alkalinity. It is the negative logarithm of the hydrogen ion concentration. A pH of 7 is defined as neutral and large variations above or below this value are considered harmful to most aquatic life.

Pass-through – A discharge which exits the POTW into waters of the State in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation), or which is a cause of a violation of State water quality standards.

Peak hour design flow (PHDF) – The largest volume of flow anticipated to occur during a

one-hour period, expressed as a daily or hourly average.

Peak instantaneous design flow (PIDF) – The maximum anticipated instantaneous flow.

Point of compliance – The location in the groundwater where the enforcement limit must not be exceeded and a facility must comply with the Ground Water Quality Standards. Ecology determines this limit on a site-specific basis. Ecology locates the point of compliance in the groundwater as near and directly downgradient from the pollutant source as technically, hydrogeologically, and geographically feasible, unless it approves an alternative point of compliance.

Potential significant industrial user (PSIU) – A potential significant industrial user is defined as an Industrial User that does not meet the criteria for a Significant Industrial User, but which discharges wastewater meeting one or more of the following criteria:

- Exceeds 0.5 % of treatment plant design capacity criteria and discharges <25,000 gallons per day or;
- Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (e.g. facilities which develop photographic film or paper, and car washes).

Ecology may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

Quantitation level (QL) – also known as Minimum level (ML) – The term ‘‘minimum level’’ refers to either the sample concentration equivalent to the lowest calibration point in a method or a multiple of the method detection limit (DL), whichever is higher. Minimum levels may be obtained in several ways: They may be published in a method; they may be based on the lowest acceptable calibration point used by a laboratory; or they may be calculated by multiplying the DL in a method, or the DL determined by a laboratory, by a factor of 3. For the purposes of NPDES compliance monitoring, EPA considers the following terms to be synonymous: ‘‘quantitation limit,’’ ‘‘reporting limit,’’ and ‘‘minimum level’’.

Reasonable potential – A reasonable potential to cause or contribute to a water quality violation, or loss of sensitive and/or important habitat.

Responsible corporate officer – A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or have gross annual sales or expenditures exceeding $25 million (in second quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures (40 CFR 122.22).

Sample Maximum – No sample may exceed this value.

Significant industrial user (SIU) –

- All industrial users subject to Categorical Pretreatment Standards under 40 CFR Chapter I, Subchapter N and 40 CFR 403.6 and;
- Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement [in accordance with 40 CFR 403.8(f)(6)].

Upon finding that the industrial user meeting the criteria in the second paragraph has no reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement, the Control Authority* may at

any time, on its own initiative or in response to a petition received from an industrial user or POTW, and in accordance with 40 CFR 403.8(f)(6), determine that such industrial user is not a significant industrial user.

*The term "Control Authority" refers to the Washington State Department of Ecology in the case of non-delegated POTWs or to the POTW in the case of delegated POTWs.

Slug discharge – Any discharge of a non-routine, episodic nature, including but not limited to an accidental spill or a non-customary batch discharge to the POTW. This may include any pollutant released at a flow rate that may cause interference or pass through with the POTW or in any way violate the permit conditions or the POTW's regulations and local limits.

Soil scientist – An individual who is registered as a Certified or Registered Professional Soil Scientist or as a Certified Professional Soil Specialist by the American Registry of Certified Professionals in Agronomy, Crops, and Soils or by the National Society of Consulting Scientists or who has the credentials for membership. Minimum requirements for eligibility are: possession of a baccalaureate, masters, or doctorate degree from a U.S. or Canadian institution with a minimum of 30 semester hours or 45 quarter hours professional core courses in agronomy, crops or soils, and have 5, 3, or 1 years, respectively, of professional experience working in the area of agronomy, crops, or soils.

Solid waste – All putrescible and non-putrescible solid and semisolid wastes including, but not limited to, garbage, rubbish, ashes, industrial wastes, swill, sewage sludge, demolition and construction wastes, abandoned vehicles or parts thereof, contaminated soils and contaminated dredged material, and recyclable materials.

Soluble BOD_5 – Determining the soluble fraction of Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of soluble organic material present in an effluent that is utilized by bacteria. Although the soluble BOD_5 test is not specifically described in Standard Methods, filtering the raw sample through at least a 1.2 um filter prior to running the standard BOD_5 test is sufficient to remove the particulate organic fraction.

State waters – Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of the state of Washington.

Stormwater – That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a stormwater drainage system into a defined surface water body, or a constructed infiltration facility.

Technology-based effluent limit – A permit limit based on the ability of a treatment method to reduce the pollutant.

Total coliform bacteria – A microbiological test, which detects and enumerates the total coliform group of bacteria in water samples.

Total dissolved solids – That portion of total solids in water or wastewater that passes through a specific filter.

Total maximum daily load (TMDL) – A determination of the amount of pollutant that a water body can receive and still meet water quality standards.

Total suspended solids (TSS) – Total suspended solids is the particulate material in an effluent. Large quantities of TSS discharged to a receiving water may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

Upset – An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventative maintenance, or careless or improper operation.

Water quality-based effluent limit – A limit imposed on the concentration of an effluent parameter to prevent the concentration of that parameter from exceeding its water quality criterion after discharge into receiving waters.

Appendix D — Technical Calculations

CORMIX Chronic Output Report

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

CORMIX MIXING ZONE EXPERT SYSTEM

CORMIX Version 12.0GTD

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SUMMARY OF INPUT DATA:

AMBIENT PARAMETERS:

Cross-section = bounded

Width BS = 560.83 m

Channel regularity ICHREG = 1

Ambient flowrate QA = 1181.89 m^3/s

Average depth HA = 6.91 m

Depth at discharge HD = 8.99 m

Ambient velocity UA = 0.3048 m/s

Darcy-Weisbach friction factor F = 0.0258

Calculated from Manning's n = 0.025

Wind velocity UW = 2 m/s

Stratification Type STRCND = U

Surface temperature = 18.40 degC

Bottom temperature = 18.40 degC

Calculated FRESH-WATER DENSITY values:

Surface density RHOAS = 998.5218 kg/m^3

Bottom density RHOAB = 998.5218 kg/m^3

DISCHARGE PARAMETERS: Single Port Discharge

Nearest bank = right

Distance to bank DISTB = 152.40 m

Port diameter D0 = 0.1524 m

Port cross-sectional area A0 = 0.0182 m^2

Discharge velocity U0 = 0.14 m/s

Discharge flowrate Q0 = 0.002585 m^3/s

Discharge port height H0 = 1.52 m

Vertical discharge angle THETA = -6.8 deg

Horizontal discharge angle SIGMA = 90 deg

Discharge temperature (freshwater) = 22 degC

Corresponding density RHO0 = 997.7714 kg/m^3

Density difference DRHO = 0.7504 kg/m^3

Buoyant acceleration GP0 = 0.0074 m/s^2

Discharge concentration C0 = 100 %

Surface heat exchange coeff. KS = 0 m/s

Coefficient of decay KD = 0 /s

DISCHARGE/ENVIRONMENT LENGTH SCALES:

LQ = 0.14 m Lm = 0.06 m Lb = 0.00 m

LM = 0.61 m Lm' = 99999 m Lb' = 99999 m

NON-DIMENSIONAL PARAMETERS:

Port densimetric Froude number FR0 = 4.23

Velocity ratio R = 0.46

MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:

Toxic discharge = no

Water quality standard specified = yes

Water quality standard CSTD = 100 %

Regulatory mixing zone = yes

Regulatory mixing zone specification = distance

Regulatory mixing zone value = 98.36 m (m^2 if area)

Region of interest = 5608.32 m

****

HYDRODYNAMIC CLASSIFICATION:

| FLOW CLASS = H1 |

This flow configuration applies to a layer corresponding to the full water depth at the discharge site.

Applicable layer depth = water depth = 8.99 m

Limiting Dilution S = (QA/Q0)+ 1.0 = 457220.9

****

MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

X-Y-Z Coordinate system:

Origin is located at the BOTTOM below the port/diffuser center:

152.40 m from the right bank/shore.

Number of display steps NSTEP = 10 per module.

NEAR-FIELD REGION (NFR) CONDITIONS :

Note: The NFR is the zone of strong initial mixing. It has no regulatory implication. However, this information may be useful for the discharge

designer because the mixing in the NFR is usually sensitive to the discharge design conditions.

Pollutant concentration at NFR edge c = 0.0376 %

Dilution at edge of NFR s = 2657.2

NFR Location: x = 449.53 m

(centerline coordinates) y = 0.20 m

z = 8.99 m

NFR plume dimensions: half-width (bh) = 3.36 m

thickness (bv) = 3.36 m

Cumulative travel time: 1465.2731 sec.

Buoyancy assessment:

The effluent density is less than the surrounding ambient water density at the discharge level.

Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards the surface.

FAR-FIELD MIXING SUMMARY:

Plume becomes vertically fully mixed at 965.41 m downstream.

PLUME BANK CONTACT SUMMARY:

Plume in bounded section does not contact bank.

********** TOXIC DILUTION ZONE SUMMARY **********

No TDZ was specified for this simulation.

********** REGULATORY MIXING ZONE SUMMARY **********

The plume conditions at the boundary of the specified RMZ are as follows:

Pollutant concentration c = 0.408103 %

Corresponding dilution s = 245.0

Plume location: x = 98.36 m
(centerline coordinates) y = 0.20 m
z = 3.27 m
Plume dimensions: half-width (bh) = 0.68 m
thickness (bv) = 1.36 m
Cumulative travel time < 1465.2731 sec. (RMZ is within NFR)

Note:
Plume concentration c and dilution s values are reported based on prediction file values - assuming linear interpolation between predicted points just before and just after the RMZ boundary has been detected.

Please ensure a small step size is used in the prediction file to account for this linear interpolation. Step size can be controlled by increasing (reduces the prediction step size) or decreasing (increases the prediction step size) the - Output Steps per Module - in CORMIX input.

At RMZ, plume centerline distance to right bank = 152.60 m
Discharge location distance to right bank (DISTB) = 152.40 m
At RMZ, plume half-width (BHLMZ) = 0.68 m

Furthermore, the specified water quality standard has indeed been met within the RMZ. In particular:
The ambient water quality standard was encountered within a control volume describing a portion of the discharge plume.
Therefore, the following plume conditions are a conservative estimate (with lower concentrations or with larger dimensions) for the region at whose boundary the standard is met:

Local boundary concentration = 100 %

Corresponding dilution = 1

Water quality standard = 100 %

Corresponding dilution s = 1

Plume location: x = 0 m

(centerline coordinates) y = 0 m

z = 1.52 m

Plume dimensions: half-width (bh) = 0.08 m

thickness (bv) = 0.08 m

Regulatory Mixing Zone Analysis:

The specified RMZ occurs within the near-field region (NFR). This RMZ specification may be highly restrictive.

********** FINAL DESIGN ADVICE AND COMMENTS **********

REMINDER: The user must take note that HYDRODYNAMIC MODELING by any known technique is NOT AN EXACT SCIENCE.

Extensive comparison with field and laboratory data has shown that the CORMIX predictions on dilutions and concentrations (with associated plume geometries) are reliable for the majority of cases and are accurate to within about +-50% (standard deviation).

As a further safeguard, CORMIX will not give predictions whenever it judges the design configuration as highly complex and uncertain for prediction.

CORMIX Acute Output Report

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

CORMIX MIXING ZONE EXPERT SYSTEM

CORMIX Version 12.0GTD

HYDRO1:Version-12.0.0.0 December,2020

****

SUMMARY OF INPUT DATA:

AMBIENT PARAMETERS:

Cross-section = bounded

Width BS = 560.83 m

Channel regularity ICHREG = 1

Ambient flowrate QA = 1181.89 m^3/s

Average depth HA = 6.91 m

Depth at discharge HD = 8.99 m

Ambient velocity UA = 0.3048 m/s

Darcy-Weisbach friction factor F = 0.0258

Calculated from Manning's n = 0.025

Wind velocity UW = 2 m/s

Stratification Type STRCND = U

Surface temperature = 18.40 degC

Bottom temperature = 18.40 degC

Calculated FRESH-WATER DENSITY values:

Surface density RHOAS = 998.5218 kg/m^3

Bottom density RHOAB = 998.5218 kg/m^3

DISCHARGE PARAMETERS: Single Port Discharge

Nearest bank = right

Distance to bank DISTB = 152.40 m

Port diameter D0 = 0.1524 m

Port cross-sectional area A0 = 0.0182 m^2

Discharge velocity U0 = 0.22 m/s

Discharge flowrate Q0 = 0.004083 m^3/s

Discharge port height H0 = 1.52 m

Vertical discharge angle THETA = -6.8 deg

Horizontal discharge angle SIGMA = 90 deg

Discharge temperature (freshwater) = 22 degC

Corresponding density RHO0 = 997.7714 kg/m^3

Density difference DRHO = 0.7504 kg/m^3

Buoyant acceleration GP0 = 0.0074 m/s^2

Discharge concentration C0 = 100 %

Surface heat exchange coeff. KS = 0 m/s

Coefficient of decay KD = 0 /s

DISCHARGE/ENVIRONMENT LENGTH SCALES:

LQ = 0.14 m Lm = 0.10 m Lb = 0.00 m

LM = 0.96 m Lm' = 99999 m Lb' = 99999 m

NON-DIMENSIONAL PARAMETERS:

Port densimetric Froude number FR0 = 6.68

Velocity ratio R = 0.73

MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:

Toxic discharge = no

Water quality standard specified = yes

Water quality standard CSTD = 100 %

Regulatory mixing zone = yes

Regulatory mixing zone specification = distance

Regulatory mixing zone value = 9.85 m (m^2 if area)

Region of interest = 5608.32 m

****

HYDRODYNAMIC CLASSIFICATION:

| FLOW CLASS = H1 |

This flow configuration applies to a layer corresponding to the full water depth at the discharge site.

Applicable layer depth = water depth = 8.99 m

Limiting Dilution S = (QA/Q0)+ 1.0 = 289442.8

****

MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

X-Y-Z Coordinate system:

Origin is located at the BOTTOM below the port/diffuser center:

152.40 m from the right bank/shore.

Number of display steps NSTEP = 10 per module.

NEAR-FIELD REGION (NFR) CONDITIONS :

Note: The NFR is the zone of strong initial mixing. It has no regulatory implication. However, this information may be useful for the discharge designer because the mixing in the NFR is usually sensitive to the discharge design conditions.

Pollutant concentration at NFR edge c = 0.0583 %

Dilution at edge of NFR s = 1716.2

NFR Location: x = 363.33 m
(centerline coordinates) y = 0.39 m
z = 8.99 m
NFR plume dimensions: half-width (bh) = 3.39 m
thickness (bv) = 3.39 m
Cumulative travel time: 1182.3062 sec.

Buoyancy assessment:

The effluent density is less than the surrounding ambient water density at the discharge level.
Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards the surface.

FAR-FIELD MIXING SUMMARY:

Plume becomes vertically fully mixed at 887.83 m downstream.

PLUME BANK CONTACT SUMMARY:

Plume in bounded section does not contact bank.

********** TOXIC DILUTION ZONE SUMMARY **********

No TDZ was specified for this simulation.

********** REGULATORY MIXING ZONE SUMMARY **********

The plume conditions at the boundary of the specified RMZ are as follows:

Pollutant concentration c = 5.239854 %
Corresponding dilution s = 19.1
Plume location: x = 9.85 m
(centerline coordinates) y = 0.28 m
z = 1.71 m
Plume dimensions: half-width (bh) = 0.24 m

thickness (bv) = 0.48 m

Cumulative travel time < 1182.3062 sec. (RMZ is within NFR)

Note:

Plume concentration c and dilution s values are reported based on prediction file values - assuming linear interpolation between predicted points just before and just after the RMZ boundary has been detected.

Please ensure a small step size is used in the prediction file to account for this linear interpolation. Step size can be controlled by increasing (reduces the prediction step size) or decreasing (increases the prediction step size) the - Output Steps per Module - in CORMIX input.

At RMZ, plume centerline distance to right bank = 152.68 m
Discharge location distance to right bank (DISTB) = 152.40 m
At RMZ, plume half-width (BHLMZ) = 0.24 m

Furthermore, the specified water quality standard has indeed been met within the RMZ. In particular:
The ambient water quality standard was encountered within a control volume describing a portion of the discharge plume.
Therefore, the following plume conditions are a conservative estimate (with lower concentrations or with larger dimensions) for the region at whose boundary the standard is met:
Local boundary concentration = 100 %
Corresponding dilution = 1
Water quality standard = 100 %
Corresponding dilution s = 1

Plume location: x = 0 m

(centerline coordinates) y = 0 m

z = 1.52 m

Plume dimensions: half-width (bh) = 0.08 m

thickness (bv) = 0.08 m

Regulatory Mixing Zone Analysis:

The specified RMZ occurs within the near-field region (NFR). This RMZ specification may be highly restrictive.

********** FINAL DESIGN ADVICE AND COMMENTS **********

REMINDER: The user must take note that HYDRODYNAMIC MODELING by any known technique is NOT AN EXACT SCIENCE.

Extensive comparison with field and laboratory data has shown that the CORMIX predictions on dilutions and concentrations (with associated plume geometries) are reliable for the majority of cases and are accurate to within about +-50% (standard deviation).

As a further safeguard, CORMIX will not give predictions whenever it judges the design configuration as highly complex and uncertain for prediction.

Reasonable Potential Analysis:

Ecology uses spreadsheet tools to determine reasonable potential (to cause or contribute to violations of the aquatic life and human health water quality numeric standards) and to calculate effluent limits. The process and formulas for determining reasonable potential and effluent limits in these spreadsheets come from the Technical Support Document for Water Quality-based Toxics Control, (EPA 505/2-90-001) (USEPA, 1991).

Ammonia

Reasonable Potential Calculation

Facility	Pateros POTW
Water Body Type	Freshwater
Rec. Water Hardness	** Enter Hardness on DFCalc Tab **

Dilution Factors:	Acute	Chronic
Aquatic Life	19.1	245.0
Human Health Carcinogenic		245.0
Human Health Non-Carcinogenic		245.0

Pollutant, CAS No. & NPDES Application Ref. No.			AMMONIA, Criteria as Total NH3										
Effluent Data	# of Samples (n)		111										
	Coeff of Variation (Cv)		3.45576	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)		6,930										
	Calculated 50th percentile Effluent Conc. (when n>10)												
Receiving Water Data	90th Percentile Conc., ug/L		50										
	Geo Mean, ug/L												
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute	3,825										
		Chronic	659										
	WQ Criteria for Protection of Human Health, ug/L		-										
	Metal Criteria Translator, decimal	Acute	-										
		Chronic	-										
	Carcinogen?		N										

Aquatic Life Reasonable Potential

Effluent percentile value			0.950
s	$s^2=\ln(CV^2+1)$		1.600
Pn	$Pn=(1\text{-confidence level})^{1/n}$		0.973
Multiplier			1.00
Max concentration (ug/L) at edge of...		Acute	410
		Chronic	78
Reasonable Potential? Limit Required?			**NO**

Fecal Coliform

Calculation of Fecal Coliform/E. Coli/Enterococci at Chronic Mixing Zone Ch

INPUT	
Chronic Dilution Factor	245.0
Receiving Water [bacteria indicator], #/100 ml	1
Effluent [Bacteria indicator] - worst case, #/100 ml	71
Surface Water Criterion, #/100 ml	14
OUTPUT	
[bacteria indicator] at Mixing Zone Boundary, #/100 ml	**2**
Difference between mixed and ambient, #/100 ml	0

Conclusion: At design flow, the discharge has no reasonable potential to violate water quality standards for fecal coliform.

Calculation of Dissolved Oxygen at Chronic Mixing Zone

INPUT	
Chronic Dilution Factor	245.0
Receiving Water DO Concentration, mg/L	13.2
Effluent DO Concentration, mg/L	8.9
Effluent Immediate DO Demand (IDOD), mg/L	
Surface Water Criteria, mg/L	8
OUTPUT	
DO at Mixing Zone Boundary, mg/L	**13.18**
DO decrease caused by effluent at chronic boundary, mg	**0.02**

Conclusion: At design flow, the discharge has no reasonable potential to violate water quality standards for dissolved oxygen.

References: EPA/600/6-85/002b and EPA/430/9-82-011

pH Mix-Fresh

Calculation of pH of a Mixture of Two Flows

Based on the procedure in EPA's DESCON program (EPA, 1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington D.C.)

INPUT	Test low effluent pH at the Chronic Boundary	Test high effluent pH at the Chronic Boundary	
1. Dilution Factor at Mixing Zone Boundary	245.0	245.0	
2. Ambient/Upstream/Background Conditions			
Temperature (deg C):	18.40	18.40	
pH:	7.4	8.2	
Alkalinity (mg CaCO3/L):	78.00	78.00	
3. Effluent Characteristics			
Temperature (deg C):	22.00	22.00	
pH:	6.9	7.6	<- Input effluent pH range in this row to evaluate reasonable potential.
Alkalinity (mg CaCO3/L):			
4. Aquatic Life Use Designation	Char spawning & rearing and/or core summer habitat		
OUTPUT			
1. Ionization Constants			
Upstream/Background pKa:	6.39	6.39	
Effluent pKa:	6.37	6.37	
2. Ionization Fractions			
Upstream/Background Ionization Fraction:	0.91	0.98	
Effluent Ionization Fraction:	0.77	0.94	
3. Total Inorganic Carbon			
Upstream/Background Total Inorganic Carbon (mg CaCO3/L):	86	79	
Effluent Total Inorganic Carbon (mg CaCO3/L):	0	0	
4. Condtions at Mixing Zone Boundary			
Temperature (deg C):	18.41	18.41	
Alkalinity (mg CaCO3/L):	77.68	77.68	
Total Inorganic Carbon (mg CaCO3/L):	85.60	78.89	
pKa:	6.39	6.39	
5. Allowable pH change	0.20	0.20	
RESULTS			
pH at Mixing Zone Boundary:	7.4	8.2	
pH change at Mixing Zone Boundary:	0.00	0.00	
Is permit limit needed?	NO	NO	

NH3 Statistics

Freshwater Un-ionized Ammonia Criteria Calculation
Based on Chapter 173-201A WAC, amended November 20, 2006

		mixed @ Acute Boundary
INPUT		
1. Receiving Water Temperature (deg C):	18.4	#DIV/0
2. Receiving Water pH:	8.2	#DIV/0
3. Is salmonid habitat an existing or designated use?	Yes	Yes
4. Are non-salmonid early life stages present or absent?	Present	Presen
OUTPUT		
Using mixed temp and pH at mixing zone boundaries?		no
Ratio	13.500	#DIV/0
FT	1.400	#DIV/0
FPH	1.000	#DIV/0
pKa	9.454	#DIV/0
Unionized Fraction	0.053	#DIV/0
Unionized ammonia NH3 criteria (mg/L as NH_3)		
Acute:	0.246	#DIV/0
Chronic:	0.042	#DIV/0
RESULTS		
Total ammonia nitrogen criteria (mg/L as N):		
Acute:	3.825	#DIV/0
Chronic:	0.659	

Data source:

Temperature

Freshwater Temperature Reasonable Potential and Limit Calculation

Based on WAC 173-201A-200(1)(c)(i)--(ii) and the Water Quality Program Guidance. All data inputs must meet WQ guidelines.

	Core Summer Critera	Supplemental Criteria
INPUT	**July 1-Sept 14**	**Sept 15-July 1**
1. Chronic Dilution Factor at Mixing Zone Boundary	245.0	0.0
2. 7DADMax Ambient Temperature (T) (Upstream Background 90th percentile)	15.5 °C	15.0 °C
3. 7DADMax Effluent Temperature (95th percentile)	22.0 °C	20.0 °C
4. Aquatic Life Temperature WQ Criterion in Fresh Water	16.0 °C	13.0 °C
OUTPUT		
5. Temperature at Chronic Mixing Zone Boundary:	15.5 °C	#DIV/0!
6. Incremental Temperature Increase or decrease:	0.0 °C	#DIV/0!
7. Maximum Allowable Incremental Temperature Increase:	1.2 °C	1.3 °C
8. Maximum Allowable Temperature at Mixing Zone Boundary:	16.0 °C	13.0 °C
A. If ambient temp is warmer than WQ criterion		
9. Does temp fall within this warmer temp range?	NO	YES
10. **If YES - Use TMDL-based or performance-based limit - Do Not use this spreadsheet**		
B. If ambient temp is cooler than WQ criterion but within 28/(T$_{crit}$+7) of the criterion		
11. Does temp fall within this Incremental temp. range?	YES	---
12. Temp increase allowed at mixing zone boundary, if required:	NO LIMIT	---
C. If ambient temp is cooler than (WQ criterion - 28/(T$_{crit}$+7))		
13. Does temp fall within this Incremental temp. range?	NO	---
14. Temp increase allowed at mixing zone boundary, if required:	---	---
RESULTS		
15. Do any of the above cells show a temp increase?	**NO**	**NO**
16. Temperature Limit if Required?	**NO LIMIT**	**NO LIMIT**

Notes:

Summary Stats

Variables	7Q10	30Q5
Length (x)	7 days	30 days
Recurrence (y)	10 years	5 years
Mean_Logs (u)	10.891	11.024
SD_Logs (s.d.)	0.19421	0.16764
Skew_Logs (g)	-0.14476	0.7031
K	-1.2955	-0.85346
z	-1.2811	-0.83953
Result	41,738.6 cfs	53,157.7 cfs
Har_Mean	90,928.6 cfs	

2017 I &I

Pateros Wastewater Treatment Plant

Annual Infiltration/Inflow (I/I) Report

Reporting Year: From: 01/01/17 To: 12/31/17

Max month design flow: 0.0983 MGD
Peak daily design flow: 0.18 MGD

Design Population Equivalent: 725

	Average Monthly Flow (MGD)			Total Monthly Rainfall (inches)			Population Served			Additional Sewer Lines Added	
	Year			Year			Year			Year	
Month	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016
January	0.048	0.066	0.060	0.64	2.94	1.22	525	560	580	0	0
February	0.052	0.053	0.050	0.81	0.81	1.5	525	560	580	0	0
March	0.048	0.045	0.047	0.93	3.05	1.92	525	560	580	0	0
April	0.057	0.043	0.047	0.19	0.33	2.14	525	560	580	0	0
May	0.054	0.053	0.049	0.35	0.65	1.3	525	560	580	0	0
June	0.060	0.056	0.054	0.13	0.78	0.14	525	560	580	0	0
July	0.061	0.055	0.061	0	0.15	0	525	560	580	0	0
August	0.051	0.051	0.062	0.09	0.24	0	525	560	580	0	0
September	0.051	0.052	0.041	0	0.03	0.01	525	560	580	0	0
October	0.045	0.065	0.043	0.36	2.87	0.86	525	560	580	0	0
November	0.046	0.057	0.044	0.96	0.69	1.73	525	560	580	0	0
December	0.057	0.055	0.056	2.6	0.4	0.77	525	560	580	0	0
TOTAL	**0.630**	**0.651**	**0.614**	**7.1**	**12.9**	**11.6**			**Total (feet)**	**0**	**0**
High	**0.061**	**0.066**	**0.062**						**Total (miles)**	**0.00**	**0.00**
Low	**0.045**	**0.043**	**0.041**								
Average	**0.053**	**0.054**	**0.051**								
I/I	**-0.02**	**-0.02**	**-0.02**								

Base Year: 2017 Base Year I/I: -0.02 MGD

Infiltration/Inflow Summary

Year	I/I	% increase from base I/I	% of avg. design flow
2015			#VALUE!
2016			#VALUE!
2017			#VALUE!

Comments *Max month design flow value from NPDES pg. 16; Peak daily design flow & Design Population Equivalent from WWTP Record Drawing Process Design Criteria pg. 2*

J. R. Wilson, City Administrator
Signature and Title

2017 Wasteload Assessment

Design Capacity Graphs

Table 4: Max month Flow Data

Year	max month avg Flow, mgd	design cap, mgd
2015	0.0615	0.098
2016	0.0656	0.098
2017	0.0613	0.098

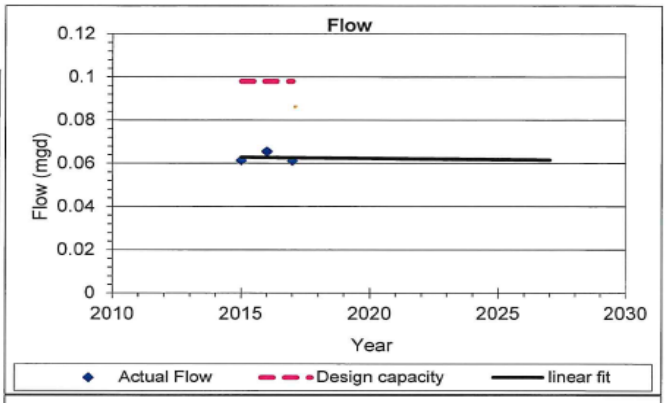


Table 5: Max month BOD Data

Year	max month avg BOD, lbs/day	design cap lbs/day
2015	122	233
2016	168.8	233
2017	135	233

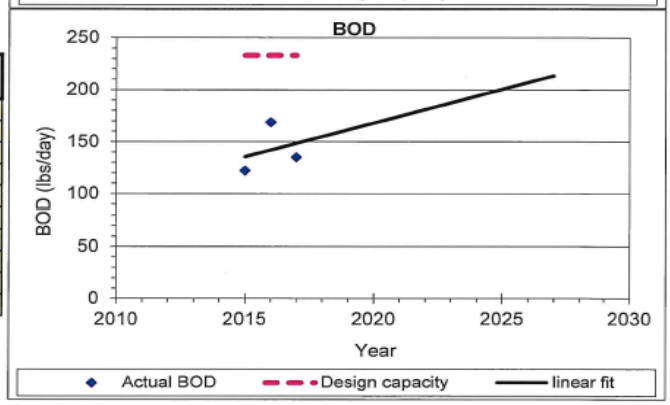
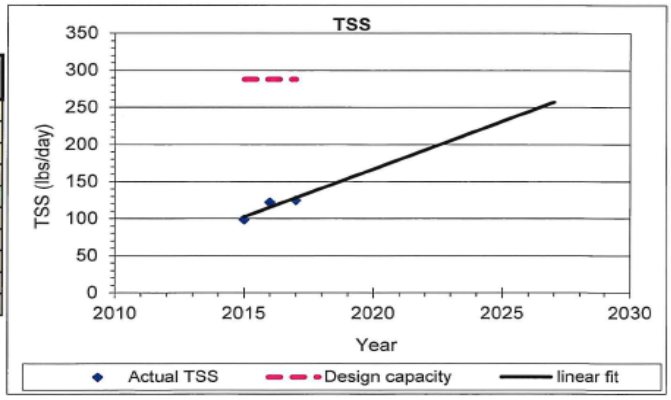
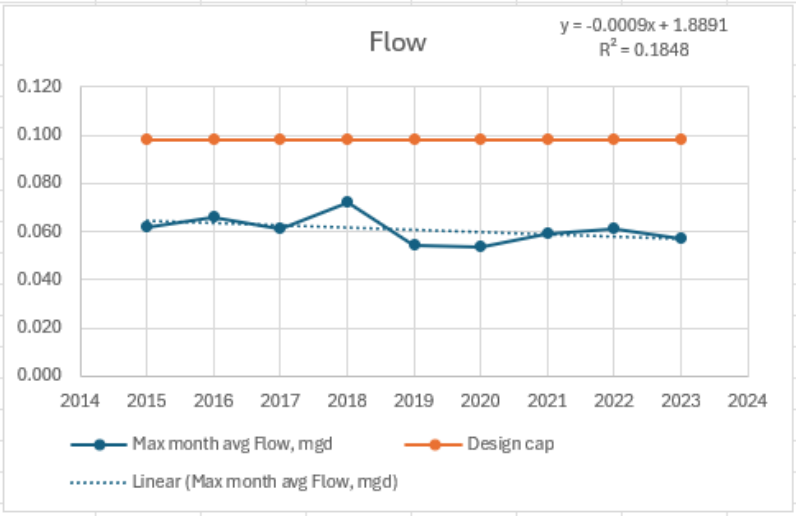


Table 6: Max month TSS Data

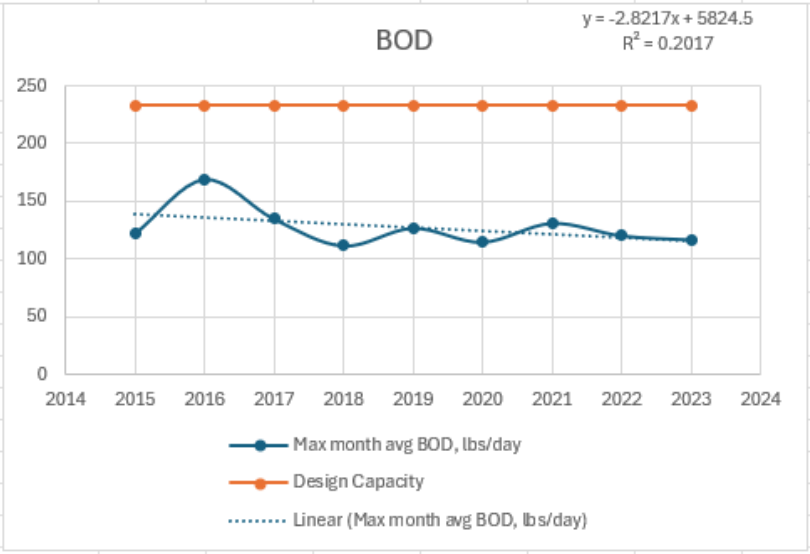
Year	max month avg TSS, lbs/day	design cap lbs/day
2015	99	288
2016	122	288
2017	124.8	288



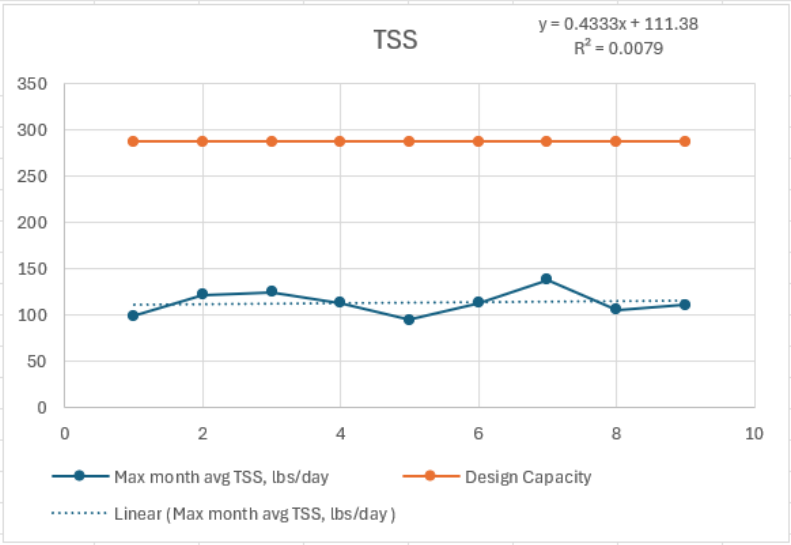
Yeah	Max month avg Flow, mgd	Design cap
2015	0.062	0.098
2016	0.066	0.098
2017	0.061	0.098
2018	0.072	0.098
2019	0.054	0.098
2020	0.054	0.098
2021	0.059	0.098
2022	0.061	0.098
2023	0.057	0.098



Year	Max month avg BOD, lbs/day	Design Capacity
2023	117	233
2022	120.5	233
2021	131.2	233
2020	115	233
2019	127	233
2018	111.8	233
2017	135	233
2016	168.8	233
2015	122	233



Yeah	Max month avg TSS, lbs/day	Design Capacity
1 (2015)	99	288
2 (2016)	122	288
3 (2017)	124.8	288
4 (2018)	113	288
5 (2019)	94.8	288
6 (2020)	113.6	288
7 (2021)	138	288
8 (2022)	106	288
9 (2023)	110.75	288



Appendix E — Response to Comments

[Ecology will complete this section after the public notice of draft period.]